

**REVIEWS: TECHNICS A/V RECEIVER MCINTOSH AMP & PREAMP**

**DENON A/V RECEIVER SPICA SPEAKER KENWOOD CD CHANGER**

# AUDIO

“HI-FI IS FULL OF  
DANGEROUS AMATEURS!”  
SOUNDMAN  
**EXCLUSIVE INTERVIEW**  
TUBE ENGINEER  
**TIM de PARAVICINI**

THE EQUIPMENT AUTHORITY

JANUARY 1995

## FULL TESTS

**TECHNICS'**  
**POWER-HOUSE**  
A/V RECEIVER

**SOUNDWAVE'S**  
**SIT-ANYWHERE**  
LOUDSPEAKER

**LUXMAN'S**  
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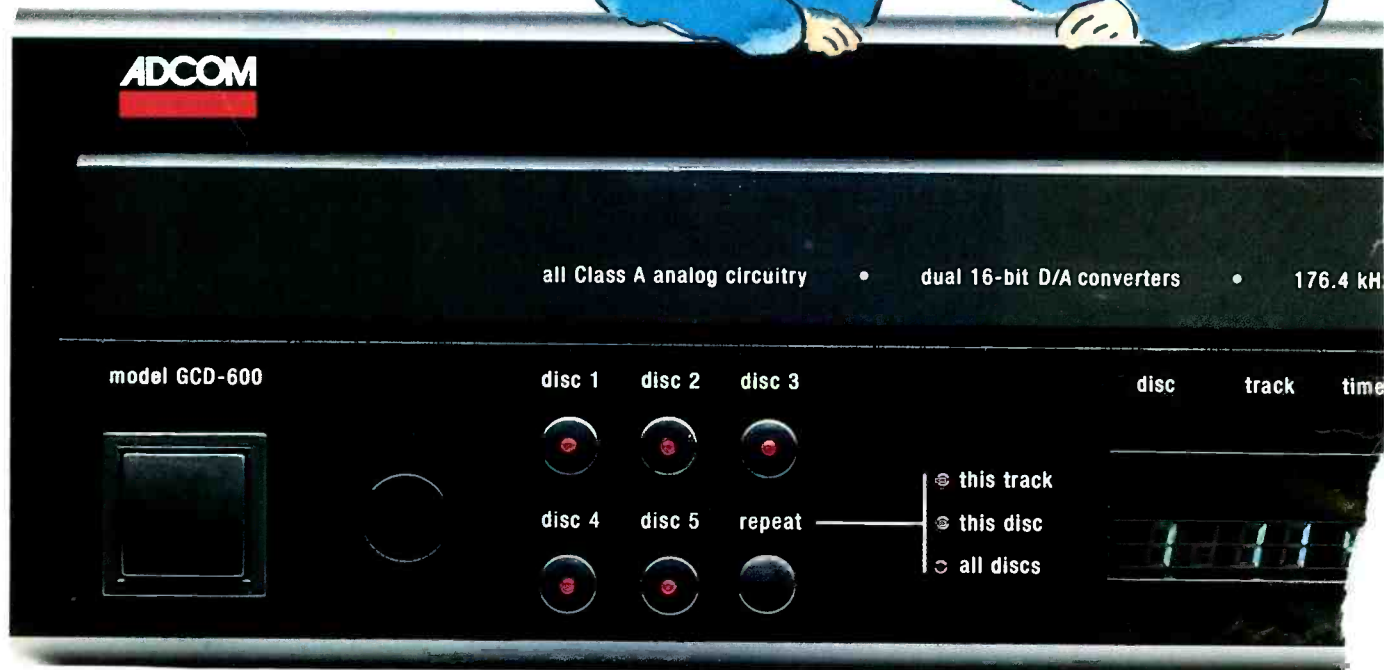
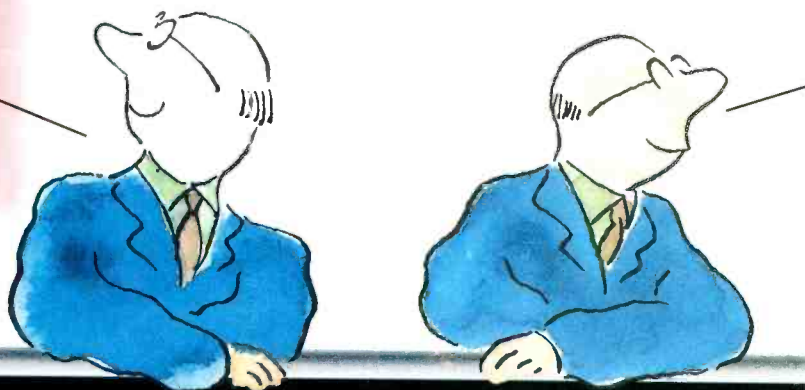
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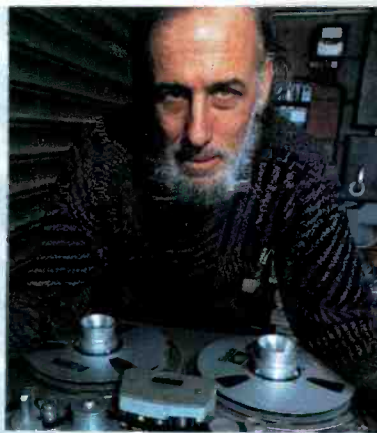
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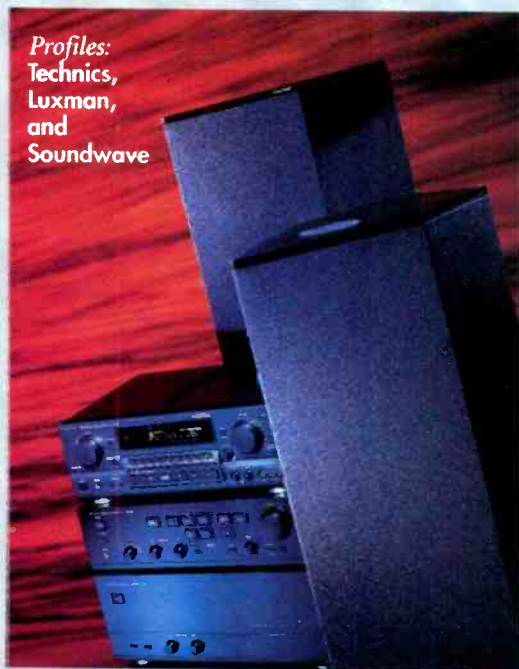
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Luxman,  
and  
Soundwave

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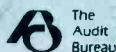
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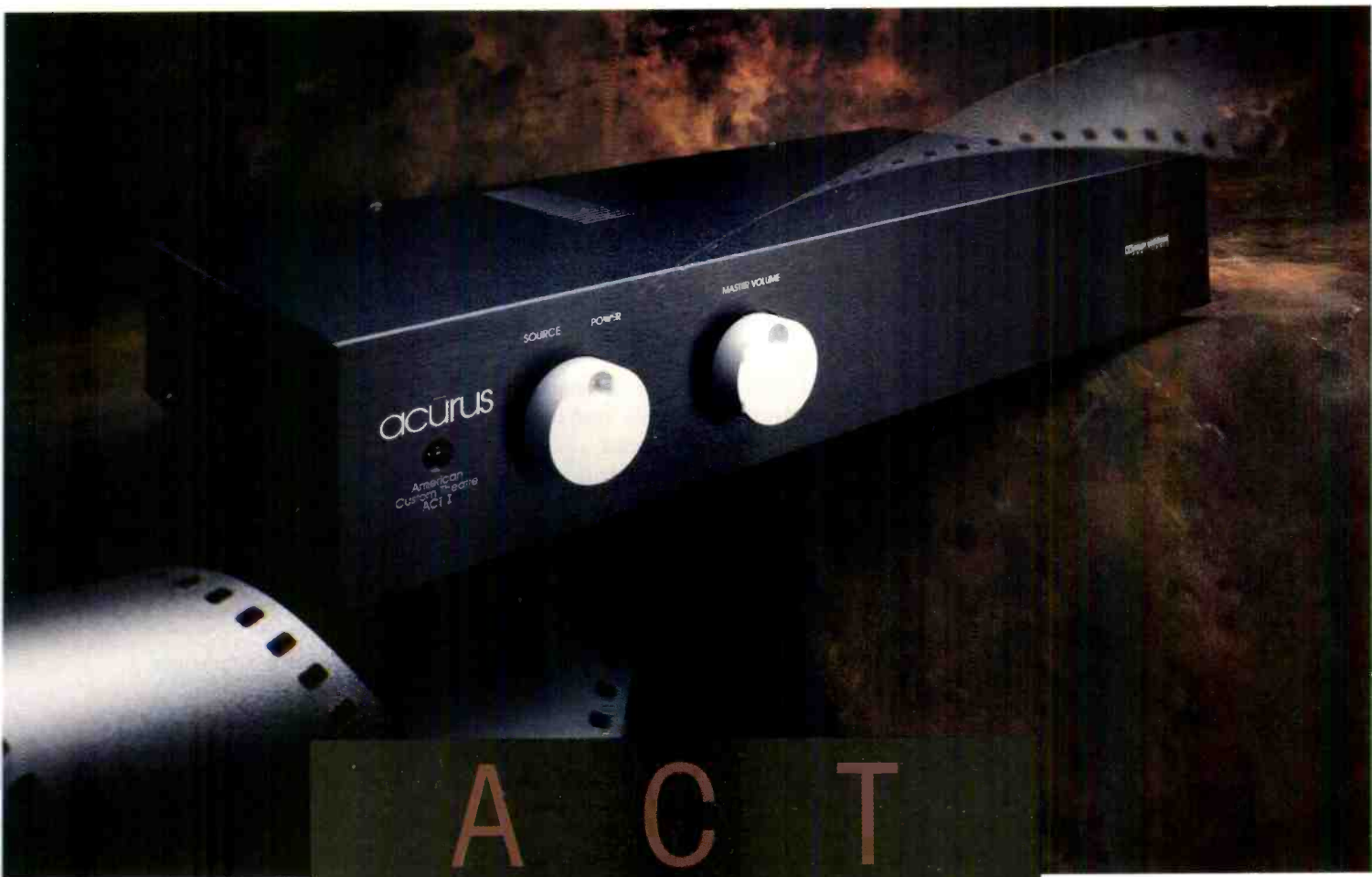
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# The three most important letters in home theatre...



# A C T

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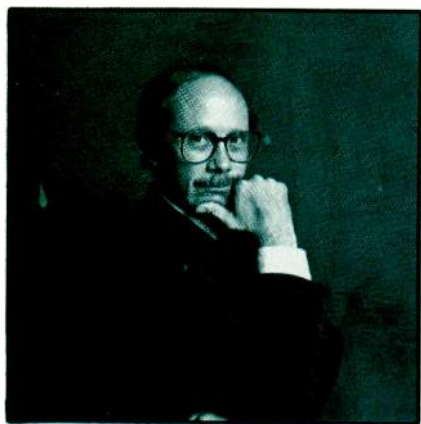
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“I like Chicago in June. How about you?” No, that’s not the revised lyrics to a song by Burton Lane and Ralph Freed (“How About You?”), but is instead the basic reaction of most people in the audio community to the news that there will be a June show in Chicago after all.

The new, stand-alone exhibition, entitled the Specialty Audio & Home Theater trade show, will take place June 17th through 19th at the Palmer House in Chicago’s Loop. The Electronic Industries Association’s Consumer Electronics Group (EIA/CEG), which had been the sponsor and manager of the Consumer Electronics Show centered at Chicago’s McCormick Place during June each year, will put on the new exhibition. So far, there’s no word that non-trade consumers would be accommodated with their own day, as had happened at the last two Chicago shows.

The most important thing about this new show and its timing—to me—is that it proves the vitality of this segment of electronics. I believe this judgment is underlined by the fact that the two leaders of the campaign to keep the June show and keep it in Chicago come from the specialist end of the business—Kathy Gornick of Thiel and Lew Johnson of conrad-johnson. Aside from being president of Thiel, Gornick is chairperson of the EIA/CEG Specialty Audio Subdivision. My thanks and compliments to them both, as well as to all those committed (was it 60?) to exhibits at the 1995 summer show.

An EIA/CEG press release quotes Gornick: “Exhibitors in specialty audio had one of their best shows ever at the 1994 Summer Consumer Electronics Show, and that led us to believe that this group would benefit from a focused show dedicated to our segment of the industry.” The new show, according to Gornick in the release, “will attract our buyers because it will have a different character without the distraction of the larger trade show. . . .” From my viewpoint, it will be much more focused and much easier to get around to these makers, who are at the heart of our industry and *Audio’s* coverage.

What’s so important about having a Chicago show in June? The fact of the matter is that the fall, starting with Labor Day and running through the Presidents’ birthdays (at least here in the New York metro area), is the hi-fi season. If, therefore, you are going to introduce products for that season, then you make a properly timed presentation to press and dealers at the show immediately previous to the season, i.e., the Summer Consumer Electronics Show.

I can only echo the words of Chris Browder, executive vice president of The Equity Group (which distributes B & W and Rotel in North America) and president of the Academy for the Advancement of High End Audio (AAHEA), to the effect that this EIA/CEG-sponsored show is the “best venue” for prospering as an industry.

While I wish prosperity on all sections of the audio industry, I think that keeping the June timing is highly important to the future success of an industry with a fall sales season.

# AUDIO

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# WHAT'S NEW



## Vandersteen Speakers

**T**he Model 3A is an upgraded version of the Vandersteen Model 3, which won widespread critical praise. Improvements include a double-spider 10-inch active acoustic coupler using a precision magnet assembly with copper end rings, a newly designed crossover and enhanced phase-compensation circuitry, improved cabinet bracing to make the cabinet more inert, and a recalibrated midrange which undergoes an accelerated break-in process equivalent to 1,000 hours of normal use. Prices: \$2,595 with standard rear brace or \$2,795 with optional Sound Anchor brace.

For literature, circle No. 105



## Apogee Sound THX Speaker System

Not just approved by Lucasfilm but actually designed by them, the Apogee THX MPTS-1 was originally built for use in mixdown of THX soundtracks. Each main channel of the triamplified system has separate enclosures for the woofer and for the midrange

drivers and tweeter horn. As the system was designed to play through perforated movie screens, an equalizer can be switched in for systems (such as home theaters) whose screen is not in front of the speaker. The MPTS-1 includes three front and four surround speaker systems, a subwoofer, and electronics. Price: \$21,255.

For literature, circle No. 107

## Recoton Wireless System

The W222SX uses 900-MHz technology to send a signal from a base transmitter to both a pair of self-amplified mini speakers and a set of headphones. With an antenna shaped like the omnidirectional circular antenna on the AWACS



surveillance airplane, the transmitter has a range of 150 feet or more. Because the signal is not limited to line of sight, as infrared signals are, the r.f. signals can be received in any room of a home, even passing through doors, walls, and ceilings. The battery-powered speakers each use a

single 3-inch driver and have a battery-saving auto-off circuit. Each is tethered to its partner by a 3-foot cord. The headphones are powered by three AA batteries and have a tuning control to help prevent interference from other 900-MHz equipment. Price: \$149.99. For literature, circle No. 108



## Canon Center-Channel Speaker

Canon's S-C10 has a grille-mounted ¾-inch tweeter and a 5¼-inch woofer. Rated frequency response is 80 Hz to 20 kHz, ±2 dB. Dispersion is ±2 dB to 10 kHz, within 30° of the axis, horizontally and vertically.

Stray magnetic flux

is limited to less than 1.5 gauss within 1¼ inches of the enclosure to prevent interference with video screens. Sensitivity is 86 dB, and recommended power is 10 to 75 watts. Price: \$199. For literature, circle No. 106

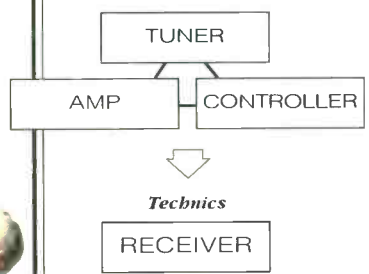
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# WHAT'S NEW



**Speakercraft  
In-Wall Speakers**

The 6.5MIT speaker uses mirror-image designs for smoother high-frequency response and improved imaging. Asymmetrical mounting of the tweeter in the baffle helps reduce the

peaks and dips caused by edge reflections. Bass loading has been optimized for in-wall mounting, and the

two-way system has a very even overall power response. Rated frequency response is 40 Hz to 22 kHz, while sensitivity is 90 dB SPL for 1 watt at 1 meter. Rated power handling is 5 to 80 watts. Price: \$465 per pair. For literature, circle No. 109



**Rayad Speakers**

Speakers don't have to look like boxes, and if they don't, placement becomes much less of a problem. Rayad attacks the boring box syndrome by placing quality drivers in ceramic vases, each of which has a unique, handmade shape and glazing. Model 4002 (left) uses a 6½-inch poly cone and a 1-inch dome, while the Model 4001 uses a 5¼-inch poly cone with the same tweeter. The 4008 subwoofer (center) uses an 8-inch driver. Prices: 4002, \$299 each; 4008, \$479 each; 4001, \$199 each. For literature, circle No. 111



**Acoustic Research  
Bookshelf Speaker**

Based on the technological principles Acoustic Research has long been known for, the AR-303 combines a 12-inch acoustic-suspension woofer with a 1½-inch dome midrange and a ¾-inch dome tweeter. Frequency response is rated as 32 Hz to 20 kHz, ±3 dB. Sensitivity is 85 dB, and impedance is rated at 6.5 ohms (3.6 ohms, minimum). Cherry wood veneer and black high-pressure laminate finishes are available. Price: \$1,199.95 per pair. For literature, circle No. 112



**Center Stage  
Satellite and Subwoofer**

Unlike many subwoofers, the Center Stage SUB has a crossover that includes a high-

pass satellite output, which rolls off below 100 Hz to protect the satellites, as well as the usual low-pass filter. The SUB's frequency response is 30 to 90 Hz, ±3 dB, and sensitivity of the sealed-box 12-inch system is 92 dB. The Model 1000 satellite is a two-way vented design with a

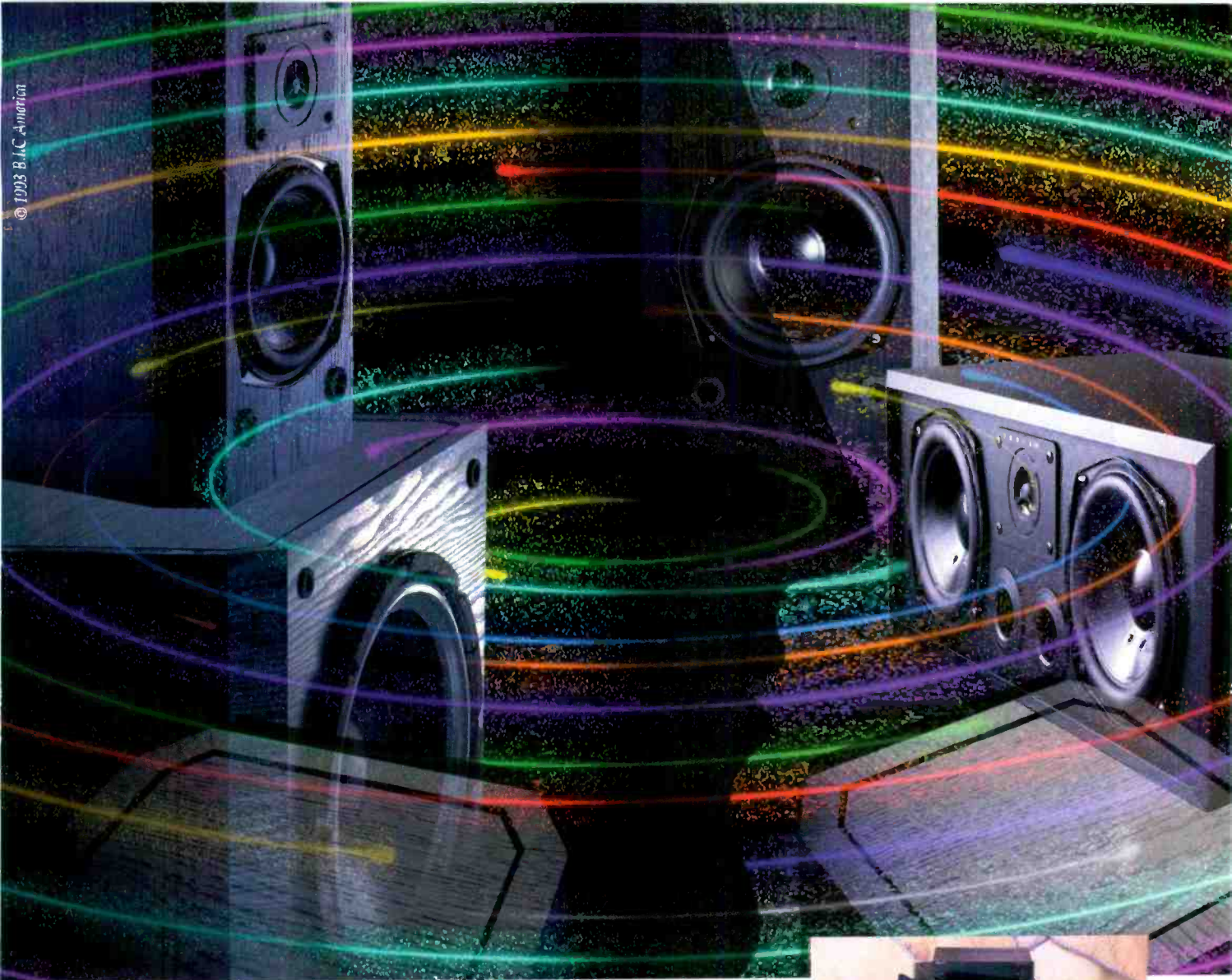
5¼-inch woofer; frequency response is 65 Hz to 20 kHz, ±3 dB, and sensitivity is 87 dB. Prices: SUB, \$599; Model 1000, \$498 per pair. For literature, circle No. 110



**PSB  
Center-Channel Speaker**

The Stratus C5 is intended to be a handsome complement to any home theater system, using real wood components and finishes throughout. The rigid, resonance-free cabinet contains dual 5¼-inch mid-

woofers, which are horizontally deployed, and two vertically stacked, poly-flare ½-inch tweeters. The sensitivity and power handling of the C5 make it suitable for use with amps delivering 10 to 150 watts. Price: \$500. For literature, circle No. 113



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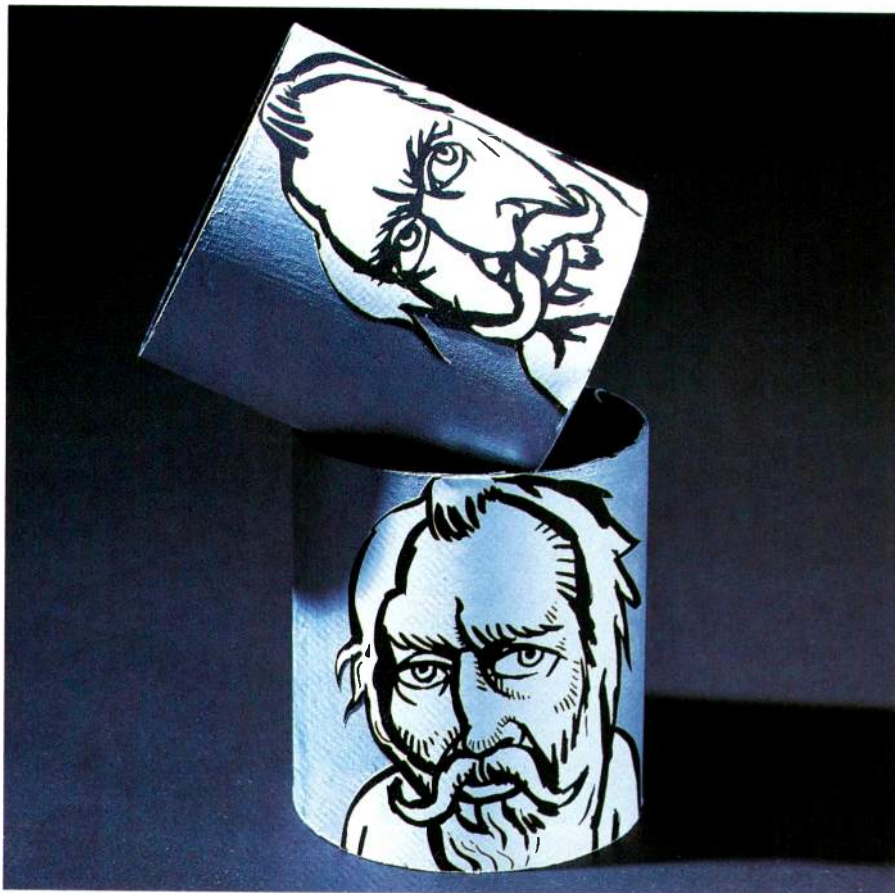
# Venturi™

Home Theater Speaker Systems by **B.I.C.** America

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EDWARD TATNALL CANBY

## BRAHMS VARIATION NO. IV



**B**ack in August, I left things hanging once again in respect to that precious and minute (in both senses) 1889 Edison cylinder recording of Johannes Brahms playing piano, improvised, and (maybe) speaking. Seems that the deadly disease I mentioned, the reverse trip along the Information Highway, allows me to be interactive on Edison-Brahms exactly every five months! I promised more—here it is, right on schedule.

I begin with that Professor of Communications who has been so outstandingly helpful to me on the Brahms, Dr. Michael Biel of the Dept. of Communications, More-

head State University, Kentucky. Dr. Biel was just back from a professional conference in Berlin as I prepared to write this. He had gone straight to the Stadtbibliothek Berlin, where there was no Brahms. But that was the *city* library, and instead of the Brahms he found an intriguing display of some 40 years of East German nude photography.

From there he was directed to the Staatsbibliothek zu Berlin—note the similarity—which is the *country* library, that is, the whole of Germany.

**UNKNOWN TO MOST  
IN THE U.S., THE ORIGINAL  
BRAHMS CYLINDER HAD  
TWO MUSICAL SELECTIONS.**

At that library he waved his potent professional IDs, very useful, and in short order he found himself actually *holding the Brahms cylinder in his hands*, in a see-through case and under the watchful eyes of a curator, one Franz Ziegler.

So the cylinder, or at least *a* cylinder, is truly there! If you find the right museum. But in a sad state of disrepair, as previously described. Broken, cracked, the grooves barely existing due to an unfortunate partial shaving-off, surely by mistake—all this the reason for the prevalent use today of the 1935 disc copies (78 acetates) for reissue. The discs were made, as I explained, when the cylinder—*a* cylinder—was donated to the Library at that time. They were intended as archival “safeties” and evidently were made well before the shaving-down of the grooves. As state-of-the-art 1935 audio, they are far from ideal today but, alas, better than copies of the Berlin cylinder in its present (and long past) state.

Is this, then, the end of the story? Not by any means. Though much that is left is mystery and speculation. My August '94 account was all-European, but there is the American side too, of considerable interest and, indeed, a quite absorbing mystery.

Is there *another* cylinder, perhaps in the U.S., the one mentioned in February '94? It would now be in Maryland, moved from California along with its owner—if it exists at all. Nobody's saying. Total clam. This hypothetical cylinder could be either a direct copy—quite possible in the early years, all the way back to

the turn of the century and before. Or, a wild speculation on my part, the *actual original*, the Berlin cylinder being a sur-

reptitious early copy itself! Not beyond possibility, after the original possessors, friends of Brahms, relinquished control.

Illustration: Scott Menchini

Ace Ventura:	
Pet Detective	*1242908
The Pelican Brief	*1251305
Top Gun	0426908
Beethoven's 2nd	*1241504
Monty Python's The Meaning Of Life	0523902
Monty Python's & Now 4 Something Completely Different	*0177204
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Star Trek V: The Final Frontier	*0448605
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Falling Down	*1134006
Fearless	*1207109
Indochine (Subtitled)	*1188903
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Mad Max - The Road Warrior	*1261106
Mad Max Beyond Thunderdome	*1261205
Striking Distance	*1200708
Visions Of Light	1221407
Arsenic And Old Lace	0073502
The Prince Of Tides	*0847103
Runaway Train	*1189406
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Unforgiven (1992)	*1084003
Rising Sun	*1174804
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The Last Action Hero	*1154806
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Batman: Mask Of The Phantasm	*1238906

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Moonstruck	*1252204
My Life	*1246305
Reality Bites	*1260900
Remains Of The Day	*1232503
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Shadowlands	*1239201
The Sound Of Music	*0003905
Predator	*0364901
Predator 2	*0104307
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Hard Target	*1179605
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2001: A Space Odyssey	*0844308
Patriot Games	*1051309
Basic Instinct	*1033208
The Wizard Of Oz	0001404
Batman (1989)	*0642504
Batman Returns	*1029909
Bram Stoker's Dracula	*1102904
Die Hard	*0367607
Die Hard 2: Die Harder	*0041806

The Abyss	*0881102
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If another genuine early cylinder could thus be located, whether it's a copy or an original, Dr. Biel implies that it might prove to be sonically authoritative—a "pantograph" copy could easily pass for the Brahms cylinder itself.

The discovery would be sensational (I speculate)! Much of the lost information could be restored, from unscrapped full-depth grooves. And perhaps the confusions over the original opening words could be untangled. (In the 1935 disc masters prepared for publication, apparently some new words were added, perhaps even in English!)

Dr. Biel warns us that even if such a cylinder seems to exist, it could be a fake—made on a cylinder machine from one of the common modern disc or tape versions, to take advantage of some gullible (and moneyed) collector. Such a fake, however, could be quickly detected by a knowledgeable pro—Dr. Biel, for instance.

That is the status quo. Heavy clamping continues! No further word from the engineer who was creating a new digitally restored version via the Ronald Coifman method (September 1993), though I talked to him on the phone and found him entirely friendly. Probably for good reason. But what version was he using for the Coifman processing? No info. So the clams remain clammy so far. I'm not about to force their shells.

But aha! Here comes a part I had to omit last August. I waxed too lengthily. There is a crucial factor, seemingly unknown to most of us here in the U.S.: The original cylinder contained *two* musical selections. *All* of the later reissues have only one, the improvisation (it is that) on the Brahms Hungarian Dance No. 1, a familiar musical theme to most of us. This second piece remains more or less unidentified. There are various claims. It is not by Brahms, though played (or improvised upon) by him. I am amused at the scholarly hoopla that has surrounded this bit of music! One assiduous worker, way back, took it down from the recording (when? which?) and wrote an extensive article upon same, published with the notes of the music. Still, as I remember, not finally identified. Controversy has raged somewhat preposterously—was it a polka or a waltz? I could tell you in seconds if I could

hear it: A polka is in up-beat lively twos; a waltz, as anybody ought to know, is in threes, with that tricky Viennese hesitation in the middle! As to the composer, it really doesn't matter. Brahms plays it, which is what counts.

Now for some reason (perhaps already existing faults in the cylinder), the 1935 disc archive copies—and the briefly published 78 disc along with them—*do not include this second piece*. Never. The only extant reproduction of it, probably unintelligible by now, is on the still-existing 15-inch tapes in Vienna (see August '94), six tries made direct from the Berlin cylinder a decade-plus ago, hopefully as a base for a first digital restoration. They were eventually not used—but they are there. Dr. Biel may yet get a copy. The Viennese engineers eventually turned back to

**THERE ARE DOUBTS  
ABOUT THE CONTENT  
OF THE CYLINDER'S  
SPOKEN INTRODUCTION.**

the 1935 discs, a goodly number, all repeated tries for the best possible transfer c. 1935. These included acetates that were discovered only recently in London. None of these, apparently, included that second piece—polka or waltz or whatever. And this, you see, is a fine clue as to the authenticity of any existing other earlier cylinder! It almost certainly would have two pieces of music on it, not just one. A modern fake would have only the one.

So if you know of a Brahms cylinder—or any other type of recording—with *two* pieces of music on it played by Brahms, get going! You may have a bonanza on your hands.

One of the curious doubts concerning the original Brahms cylinder, left behind in 1889 as faulty (Brahms would not make another try) at the house where it was made, concerns the content of the spoken introduction before the music starts. It is in that part of the cylinder that a piece was later broken off, and much later, 1983, a reinforcing rubber band put on the now fragile recording, obscuring still more speech. The opening words, then, are lost.

(Unless on that hypothetical other early cylinder . . .) What words? It is astonishing to read the different versions put forth! In Europe, it is assumed, too, that the body of the introduction is spoken not by Brahms but by the Edison technician, Theo Wangemann. What, then, of the often cited "I am Doktor Brahms, Johannes Brahms"? Wangemann would hardly have faked that, with the composer right beside him at the piano! (On the taped copy of the 1983 Vienna 45-rpm disc, I do not hear any recognizable "I am" or "Ich bin," but the name Brahms, twice, is very definitely audible.)

And then there is that curious direct salutation to Edison, sometimes cited. Could it have been in English? Surely not on any of the 1935 acetate discs. More likely, it could have been added soon after for the limited-edition 78 pressing, during a "live" re-recording session. But a spurious Brahms? Not exactly likely. Instead, I envision merely some sort of helpful new addition to the original introduction, just for the published version. English? Yes, possibly. The publisher, who was at the 1935 copying sessions in Berlin, did indeed retire to England, accounting for the recent disc discoveries there.

As I imagine it, with Brahms at the piano and in a hurry to get started (he supposedly began too soon), an announcement by him does seem unlikely. These were not microphone days! If so, too bad. I think I would as gladly hear the actual voice of Brahms as his improvisations on the piano, however ingenious as music.


Note that the pitch on the recent 1983 digital recording was adjusted to about a half-tone lower than our present A = 440, a good estimate for Brahms' piano tuning. That puts the voice where it belongs, not the nervous tenor reported in some hearings. The voice I hear myself is *not* a tenor, whether Brahms or Wangemann.

I hope you will pardon some repetition in the present fourth installment—Sept. '93, Feb. '94, Aug. '94, and now this. Have to make sense for those who missed. May I suggest that readers with any further information let me know—and particularly those who may see fit to un-clam themselves. If they do, I'll be happy to spread out any "publicity" worth telling or respect a continued clammy, if so desired. The story isn't over yet. A



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JOHN EARGLE

## RESCALING EVEREST

**A**t a recent press conference in the New York City studios of Sony Classical, Seymour Solomon, president of Vanguard Classics, announced his company's plans to issue on Compact Disc the entire Everest stereo catalog. Those of us who knew the late Bert Whyte had ad-

Whyte was not happy with the distortion and print-through of even the best tape stock and the best Ampex recorders of the day, so he went to John Frayne of Westrex to tap into the advanced recording technology that had been developed for stereophonic motion-picture sound during the mid-1950s. The

log became history, and only middle-aged audiophiles spoke of it.

In 1989, Philips leased a small number of Everest masters and reissued them on CD in its Legendary Classics series. Many of us thought this would be the rebirth of the catalog, but we were disappointed. To my knowledge, no more than six items were released in this series. Earlier along the way, there had been a handful of Everest reissues on LP, aimed primarily at the audiophile LP market as it came of age in the 1970s.

But back to the present. Seymour Solomon described seeing the Everest masters in a tape vault in Los



vance word of this as early as last winter—and as soon as that word leaked out, audiophiles had just cause for rejoicing.

Everest was an unusual company. A division of Belock Instrument Corp., it was only in business from the late 1950s to the early '60s. Harry Belock and Bert Whyte were the men who made it run, and during its short existence the company turned out more than 90 stereo LPs and tapes. The repertoire was basically orchestral and tended toward the showpieces of the late 19th and early 20th centuries. Orchestras, conductors, and venues were among the best, and the recordings more than held their own with those of the major labels. As Mercury had done earlier, Everest proved that a newcomer to the commercial classical recording scene could not only compete in musical terms but show the majors a few things in the technical department as well.

thick oxide coating and base material of 35-mm magnetic film, along with its 18-ips speed, provided the extended frequency response and low print-through Whyte was looking for. The bulk of Everest's product was recorded with this technology, that is, in three-channel stereo, but matters of expense eventually forced the company to use standard half-inch, three-track tape mastering as well.

When Belock decided to leave the record business, he sold the Everest catalog to a company in Los Angeles. Few, if any, additions were made to the catalog, and the high quality of transfers and pressings was not maintained. Eventually, the marketplace forgot about Everest; the cata-

Angeles in 1993. There they were—sealed in their cans and unopened for three decades. (He likened the experience to Howard Carter's taking that first glimpse of King Tut's tomb.) When the cans were opened, there was the rancid smell of decomposing acetate base material; overall, however, the recordings were, luckily, found to be in remarkable condition.

A good part of this, Solomon explained, was due to the fact that virtually all of the post-Belock Everest LP production had been from two-track, quarter-inch tape copies of the originals—and subsequent generations of those copies. In a sense, the original master tapes had been virtually sealed for posterity, and,

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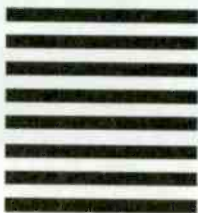


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quite fortunately for us, posterity turns out to be now.

After careful spooling of all reels and reconditioning of splices as required, the original recordings were digitally transferred via 20-bit A/D conversion. Wherever possible, replicas of the original Westrex analog gear were used, and careful attention was given to establishing the exact replay equalization of the magnetic tracks.

At this point, the digital capabilities of Sony Corp. were brought into the picture. Solomon had been impressed by Sony's Super Bit Mapping technique, which takes a 20-bit digital recording, old or new, and produces a 16-bit master that results in CDs with a lower apparent noise level than that of normal 16-bit recording. The fundamental 16-bit noise limitation is still present in the CD, but the frequency distribution of that noise has been shaped, or "remapped," so that most of it lies outside the 2- to 5-kHz range where human hearing is most sensitive. Noise-shaping is one of the hottest technical topics in digital audio today, and hardly a CD is issued without it. Noise-shaping pushes the apparent

noise envelope to even lower levels than that of CDs made just a few years ago.

Is all of this effort audible to the average listener? Maybe not as such, since most listening, even critical listening, is done in

**THE MASTERS HAD BEEN  
SEALED FOR POSTERITY;  
FORTUNATELY, POSTERITY  
TURNS OUT TO BE NOW.**

environments that are not measurably quiet enough to demonstrate the Sony technique's lower noise floor. Yet at slightly elevated monitoring levels, when care has been taken to use the quietest microphones in the quietest recording environments, the difference can be heard. Overall, I am thankful to know that the very best of modern digital technology has been lavished on these priceless analog masters.

Incidentally, the inherent noise floor of the Everest recordings is low enough that Vanguard never thought of using any kind

of digital noise-removal algorithm. I certainly believe that these reissues are the better for it.

One of Solomon's biggest problems in this vast reissue program is how to telescope the content of 90-plus LPs into 40-plus CDs. At the time of the recordings' original LP release, the playing time of a quality vinyl disc, with allowance for full bass response, was perhaps no more than 20 minutes per side. The original releases were based on this limitation. Today, of course, the CD can handle almost twice this playing time, and the decisions of which couplings are to be made—and which pieces of original album artwork are to be incorporated into the CD booklets—are anything but trivial.

So far, Vanguard's Everest project is off to a fine start. Twelve items are now available, and more titles are due in February. The current CDs are:

**Falla:** *The Three-Cornered Hat*, London Symphony Orchestra/Jorda; **Bartók:** *Dance Suite*, London Philharmonic Orchestra/Ferencsik (EVC 9000).



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**Stokowski Conducts Strauss:** "Don Juan"; "Till Eulenspiegel's Merry Pranks"; "Dance of the Seven Veils" from *Salome*, Stadium Symphony Orchestra of New York/Stokowski; **Canning:** Fantasy on a Hymn Tune, Houston Symphony Orchestra/Stokowski (EVC 9004).

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**Villa-Lobos:** "The Little Train of the Caipira"; **Antill:** "Corroboree"; **Ginastera:** "Panambi"; "Estancia," LSO/Goossens (EVC 9007).

**Bartók:** Concerto for Orchestra, Houston/Stokowski; **Kodály:** "Psalmus Hungaricus," LPO/Ferencsik (EVC 9008).

**Hindemith:** Concerto for Violin, J. Fuchs/LSO/Goossens; Symphony in E Flat, LPO/Boult (EVC 9009).

**Beethoven:** Symphonies Nos. 1 to 9, LSO/Krips (five CDs, EVC 9010 to 9014).

**The Sound of Everest:** a sampler including pieces from Bartók, Berlioz, Falla, Ginastera, Gould, Mussorgsky, Prokofiev, Rachmaninoff, Shostakovich, and Vaughan Williams, conducted by Boult, Fistoulari, Goossens, Jorda, Sargent, Stokowski, and Susskind (EVC 9050).

Next time, I will review a number of these initial releases. **A**

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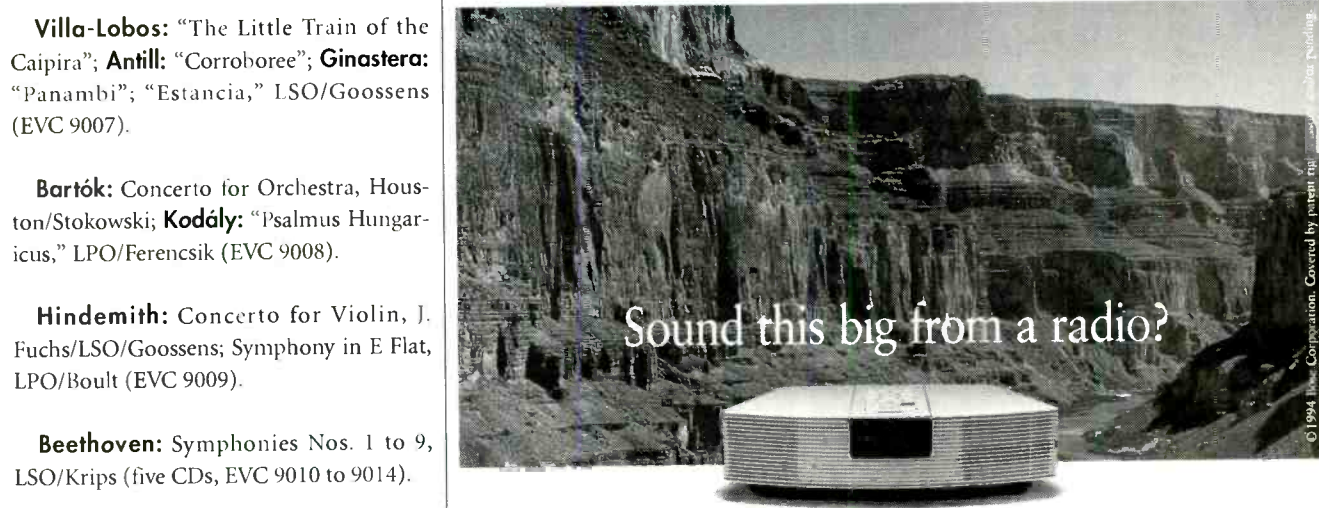
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## INTERVIEW: STAN KELLY

Stan Kelly's fully functioning workshop in his garden is also an Aladdin's cave of audio artifacts.



When Gene Pitts asked me if I'd like to conduct a series of conversations with the greats of British audio, I jumped at the opportunity. In my time as a hi-fi journalist in the U.K., I'd been saddened by the passing of Donald Aldous, Arthur Radford, John Gilbert, and other giants of audio lore; here was an opportunity to reminisce with the surviving founding fathers of the industry.

For American readers, this should provide an intriguing view of the birth of the audio scene on the other side of the Atlantic. As I learned upon moving here in the early 1970s, the U.S. and the U.K. were—prior to the appearance of the Japanese manufacturers—responsible for the bulk of audio development and manufacture, with a few notable exceptions (such as

Thorens, Studer/Revox, and Dual). And yet, Great Britain and the United States operated virtually in isolation from each other until the 1960s. Although numerous British companies exported products to the U.S. from the early 1950s onward (QUAD, Tannoy, Leak, and others had a presence in the States), a study of British hi-fi magazines and yearbooks from the 1950s reveals the presence of almost no American components whatsoever. British designers were, however, familiar with American developments, even if the British public knew only of native hardware. For example, David Hafler, while at Dynaco, was an early audio ambassador to the U.K. and even sourced transformers from Radford. Bud Fried was (and still is) another Anglophile; he imported Decca cartridges and other products into the States.

To continue this interview series, I chose to speak with Stan Kelly. Many individuals have companies which bear their names; fewer are those whose name has come to stand for a specific product. British audiophiles still refer to Stan's horn-loaded ribbon tweeter as the Kelly Ribbon, not the Decca Ribbon, even though that company took over the manufacture of the ribbon at an early date. Stan also can take credit for inventing the "flipover needle" for budget record players when 33 $\frac{1}{3}$  rpm joined 78 rpm. And he even helped Miles Henslow establish *Hi-Fi News*, the first British hi-fi magazine; Betty Kelly, Stan's wife, guaranteed Henslow's bank loans!

A spry 80-something, Stan still acts as a consultant and maintains a fully functioning workshop where he makes his own prototype drive units for various manufacturers, including the magnet assemblies and speaker baskets. The workshop in his garden is an Aladdin's cave, with some desk drawers full of ancient cartridges and others with what look like modern Infinity EMIT tweeters. "Those? I made them myself in 1956." And when Stan's memory can't be jogged, his charming wife is there to fill in names, places, and dates. The following interview is taken from conversations with Stan Kelly in November 1992 and September 1994, the latter inspired by

### New Ribbons for Old

The manufacturer of new replacement ribbon elements for Kelly speakers is H. Dawson, 16 Copeman Rd., Aylsham, Norwich NR11 6JL, England. To confound matters a bit, Presence Audio, which has the license for the manufacture of Decca products, also makes replacement ribbons; the U.S. agent for Presence is Pro Audio Ltd. (111 South Dr., Barrington, Ill. 60010; 708/526-1660).

K.K.



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the sudden appearance of a new source for Kelly replacement ribbons. [See sidebar.]

**How did you react when you learned that an independent individual had put the ribbon element back into production?**

Frankly, I had no reaction. The thing is that I wasn't making it. Decca—or the people who have taken over Decca—aren't interested in making it. If he wants to have a bash, good luck to him.

**Did you not retain any rights to the ribbon at all?**

I can't, you see. All patents lapse after 17 years. The only thing I have any individual title to is my name. If we'd have taken out a copyright on it, as distinct from or in addition to the patent, well, the copyright could have lasted forever. But we didn't.

**So what can people call this new ribbon element without your permission?**

Well, they can't call it a Kelly Ribbon without my permission, and they can't call it a Decca Ribbon without Decca's permission.

**What led you to produce a horn-loaded ribbon system in the first place?**

I wanted to make a wide-range, high-frequency transducer. At that time, I was making—here, let me show you. [He pulls out a scrapbook which itself would warrant facsimile reproduction.] At Cosmocord, where I was technical director from 1947 to 1953, we were making tonearms, pickups, and microphones. That included the first pickup ever made to play at eight grams, but I designed it to play at five. It became a standard. These [pointing to the book] were rather more ancient. And these featured the first cantilevers. Before that it was needles; I started making sapphire-tipped rods to use in place of steel needles. They were fine for playing weights of less than 20 grams. This pickup, for example, had a playing weight of 120 grams.

**How much?!**

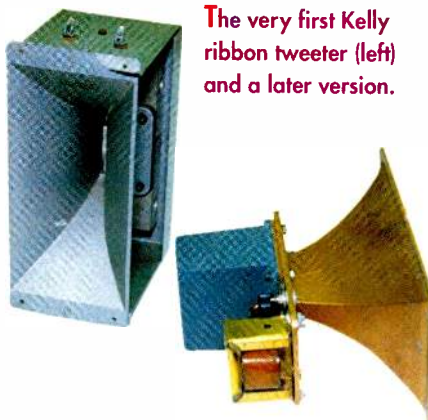
Four ounces. EMI and Decca produced their pickups at 'round about 40 to 50 grams. This was for the first LPs. I then produced the GP15 to play at eight grams. And that meant that the vinyl now had a reasonable life. Then I produced this unit, the GP20, for 78 and 33 $\frac{1}{3}$ , with two styli, one on either side.

**Had no one else thought of that before? The Americans or the Germans?**

No, no. This was a first.

**How did that idea hit you?**

It was obvious. Look, if we started with a torsion crystal instead of a bending crystal, it was quite obvious that if, on the end of



**The very first Kelly ribbon tweeter (left) and a later version.**

**BY REDESIGNING THE RIBBON'S MAGNET, I ADDED ANOTHER 6 dB TO THE EFFICIENCY.**

the crystal here, you put a bar at the back end and pushed it that way, it was twisting the crystal. If you pushed it the other way, it was also twisting the crystal. So you put two styli on it. We made a lot of 'em—this was around 1950; I left Cosmocord in 1953 and went on to start my own company, Kelly. And the first thing I manufactured was that. [He shows me the original ribbon.] The RLS-1, 3k to 20 kHz.

**Prior to introducing this drive unit, what ribbons were commercially available to audio enthusiasts?**

There was the QUAD, in production quite early. It was a much larger ribbon. But the QUAD was extremely expensive, and you had to buy a complete full-range system; you couldn't buy a single ribbon tweeter. So when I made the ribbon, I also produced a bass unit for it and a crossover network—but these were for the home constructor.

**Was the home-constructor market more important than the assembled-unit market in the mid-1950s?**

In terms of real hi-fi, yes, because with the exception of QUAD and one or two others, you couldn't buy a complete system made

up of separate components. You had to go to a specialist hi-fi dealer who had a range of amplifiers, a range of tuners, and a range of speakers and hope that he'd got the right combination.

**So how was the mass market being served?**

There was no mass-market hi-fi. Radios, radiograms, and record players. If you went to a radio shop, you could buy a radiogram, which was a tuner, record player, and speaker all in one box. And there was a whole range of those, from bad or indifferent to quite good.

**The enthusiast market to which you were addressing your products, was that an immediate postwar phenomenon or did it not take off until well into the 1950s?**

There was a hard core of "hi-fi enthusiasts" from before the war, with Donald Aldous, who later worked for *Hi-Fi News & Record Review*, handling the information side. Percy Wilson was another one, the technical editor of *The Gramophone*. Before the war, Gilbert Briggs at Wharfedale pioneered the individual loudspeaker driver, one of the first permanent-magnet, moving-coil designs. They developed the hobby from the acoustic gramophones before the war to the very crude electronic gramophones immediately before the war. Then everything went into limbo for the next five years. After the war, with all the technical developments from military electronics and the mass production of equipment, it became possible for the man in the street to buy a good audio amplifier.

**Military surplus?**

No, not military surplus. Some of the manufacturers who were making military equipment immediately went over to civilian production; they'd got the technical know-how and the production facilities to make civilian equipment.

**So when you decided to go into speaker manufacture in the early to middle 1950s, there was a ready market?**

Oh, yes. There were companies like Celestion who'd been manufacturing prewar, mainly for the domestic radio market. They had played with better speakers before the war, but after the war they then had the technical and commercial facilities to produce good-quality loudspeakers. Of course, this was very much tied up with the cones.

The normal tweeter purchase for the home constructor, before the ribbon was

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*Surround* said, "In many ways the surround sensation was every bit as good as far more expensive installations." **\$399 pr.** The smaller *The Surround II* is arguably the country's best value in a dipole radiator speaker. **\$249 pr.**

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## Home Theater Speaker Systems

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introduced, would have been a little three- or four-inch cone with a little dust cover—which was your dome, of course—and these were usually good for five watts. But you must realize that the sensitivity was about 85 dB for one watt. Yet because of the limitation in broadcast frequency range—we're talking about AM, not FM, everything was on medium wave—you were limited on the frequency response and the signal-to-noise ratio. And you were limited in exactly the same way on 78-rpm records. The speakers of the day were consistent in quality with the records and broadcasts available at the time. And then LP and FM radio triggered each other.

**So you came out with a tweeter good for 3k to 20 kHz.**

Exactly.

**Were you the first to put a ribbon in a horn?**

As far as I know. It had a 3k to 20 kHz signal, and I wanted at least half an octave on each side; on the high end this immediately outperformed any voice-coil-cum-dome or what-have-you, just because of mass and also because of the limitations on the magnet. The neodymium magnet was—well, you couldn't afford it. You had access to it, but it was like buying gold. These are cobalt. [He points to the Kelly speaker magnets.] I had to keep an eye on price, even though I was trying to go for the best performance.

**The price of the original drive unit was 12 guineas in 1955. That's equivalent to . . .**

Fifty pounds in today's money.

**That's still not very expensive, even by '50s standards.**

Agreed.

**How long did you work on the ribbon before making the first production version?**

Less than a year. The first problem was getting an efficient magnet. I didn't make many of the first type, because, by re-designing the magnet, I added another 6 dB to the efficiency. It reduced the magnet's cost, too. The ribbon, the transformer, and the horn remained constant ever since. The ribbon itself was an aluminum alloy that stayed constant; I never altered it. The horn was cast.

**Had you tried other topologies?**

Not electrostatic. I had two things against it. It was high-impedance. And high-impedance transformers are very difficult to

make because of self-capacitance and things like that. Then you've got to have polarizing voltages on it, and your high-voltage production equipment was very, very costly compared to a magnet.

**So cost ruled out using electrostatics?**

And simplicity. There's nothing to go wrong in this ribbon. If you've got a high-voltage thing with valves in it, something can go wrong. You need a power supply for it. Instead of two leads going to your loudspeaker, you had four.

**And what of the existing dynamic tweeters of the day?**

Well, they were domes. And if you had them sufficiently large enough to give you the radiation, then you were severely limited on the high-frequency side. And you had all the resonances of the dome and the suspension added to it. It worked well enough so that, during the peak of production, we were probably making about 500 drivers per month.

**How was Decca involved?**

Decca came along and said, “We want to use your speaker in our equipment.”

**So they already had their own line of loudspeakers?**

Oh, yes. So I said yes, and they said, “Look, if we make 'em, we can make them for half the price you can, because we can make four times as many. We'll take over the manufacture and give you a royalty.” That was in the early '60s. All the manufacturing moved up to their factory in the Midlands.

I then played around with tape recorders, made microphones, and then moved on to complete loudspeaker systems. We closed down Kelly in the mid-'60s, after I'd had my fill of it.

**Did you keep an eye on Decca after they took over manufacture?**

I was forbidden to. They didn't say so in so many words, but when I said I'll go up and see how they were getting on in the Midlands, they said you bloody well won't.

**So you took their word on the royalties.**

Look, I'm an engineer, not a businessman. That's the story of my life! But I was happy with Decca's drivers; they were exactly to spec. There was no way that you could complain about the quality.

**But once they took over, the name changed to Decca London?**

Yes. It was Decca-Kelly originally. And then Decca London.

A

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### The New Ensemble

*New Ensemble* is an improved version of our original dual-subwoofer/satellite speaker system. *New Ensemble* maintains the dual subwoofer design, which allows for maximum room placement flexibility. Placement of bass and high-frequency speakers in a room (and how those speakers interact with the room) has more influence on the sound quality of a music system than just about anything. *New Ensemble's* ultra-slim (4 1/2") subwoofers give you more placement flexibility than any system we know of.



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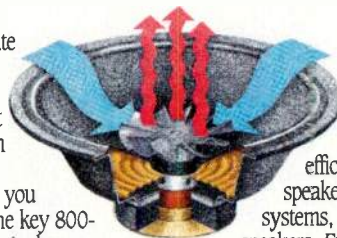
*New Ensemble II* is an improved version of our best-selling speaker system. It's more affordable than *New Ensemble* because it uses one cabinet to house both subwoofer speakers. *New Ensemble II* maintains the tonal balance, frequency range, power handling and construction quality of the original *Ensemble II*. But its satellite speakers use the same tonal balance controls as *New Ensemble's*.

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speakers are only 4 1/2" x 6 1/2" x 3" and its subwoofer is 8" x 8" x 15".

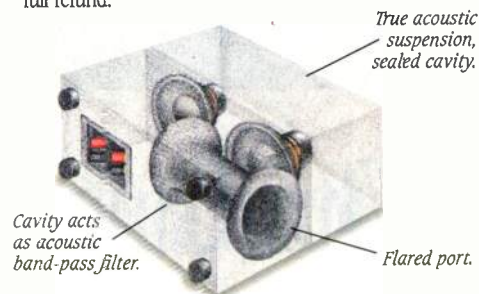
Compared to *New Ensemble II*, *Ensemble III* gives up a little in power handling, low bass range, and efficiency. Unlike the "cube" satellite speakers you'll find in most similarly priced systems, *Ensemble III's* satellites are two-way speakers. *Ensemble III's* 6 1/2" woofer uses two voice coils in a cabinet with a flared port for smooth air flow.

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### Phone Turns CD Off

**Q** *I have a peculiar situation that even my CD player's manufacturer cannot solve. If the phone rings while the player is operating, the player stops. I have a couple of telephones in the room as well as an answering machine. Could the ringing of all this equipment at once somehow affect the CD player?—Charles Yagerman, Brooklyn, N.Y.*

**A** If one of the telephones in your room is a cordless model, its base unit sends out an r.f. signal whenever a call comes in. It could be that this r.f. is finding its way into the player and causing its microprocessor to "mess up."

Whether this guess is right or not, I suggest that you remove all but one of the telephones. Arrange for a call to come in while you are playing a CD. If the machine does not malfunction, remove that phone, substitute the next one, and try again.

*Note from Charles Yagerman:* Thank you for your reply. You certainly hit the nail on the head. My cordless telephone was the culprit; when it rang, the player shut off.

*J.G.:* I appreciate hearing from you. So often I deal with a somewhat obscure problem and never do learn how it all came out.

### When To Use Dolby NR

**Q** *When recording audio and using Dolby noise reduction, is it best to use it during the playback process as well? On a related matter, many people say that Dolby noise reduction dulls the highs. Is this true?—Steven Matthews, Louisville, Ky.*

**A** Tapes recorded with Dolby noise reduction should be played back with the same type of NR (Dolby B, C, or S) for the best frequency match to the original signal. If you are copying a tape made with Dolby NR, you should have the appropriate noise-reduction switched in on both the playback and recording decks.

If the Dolby NR circuits are not properly calibrated for your tape, both in recording and in playback, the high-frequency balance will be thrown off—but this is as likely to boost the highs as cut them. This

problem most often arises when tapes recorded on one deck are played back on another.

### Power-Line Transients

**Q** *My new receiver works great—except that when I turn it on or when a light is turned on or off, I hear a "pop" from my loudspeakers. Is this normal? Will it do any damage to my system? How can I remedy the condition?—Name withheld*

**A** I rather doubt that the sound you hear, or the condition causing it, will damage any components in your system. "Pops" are common and result from sudden, or transient, voltage changes on the power line when the load on the line changes. Many audio dealers sell line filters that plug in between your equipment's line cord and the a.c. outlet, to keep such pops from getting into your equipment.

These noises can also be caused by the quick charging or discharging of your equipment's power-supply capacitors and the accompanying change of voltage in the output circuit. The voltage change will be passed along to the loudspeaker as a "pop." Some components have delay circuits that mute the output until the equipment settles down.

Sometimes the equipment maker can offer help in eliminating these problems. Check with the company about this.

### TV Interference from an Amp

**Q** *I have a Yamaha DSP-2070 digital sound-field processing amplifier, an excellent unit that has changed the way I listen to music. But when it's running, a herringbone pattern appears on the lower VHF television channels. In my situation, it is not practical to have cable TV or an outdoor antenna. I have tried moving the antenna (which has a coaxial lead-in) to various locations but got no improvement. I cannot place the Yamaha in another room. I have tried an a.c. line interference filter; again, there was no improvement. Can you help me with this problem?—Richard Townsend, Jr., Chicago, Ill.*

**A** I can only offer suggestions and hope that they will solve your problem.

Obviously, an outdoor antenna would likely cure your problem: It would provide stronger TV signals, while any interference it might pick up from your amp would be weakened by distance. Unfortunately, you say that you can't install one.

It is possible that some clock or processing signals are being radiated from your amplifier via the loudspeaker cables, power cord, or input cables. Try mounting some ferrite beads on these wires or cables, as close to the amplifier as possible. It is also possible that the TV set is picking up the interference via its power cord. Try some beads on it as well.

These beads serve as r.f. chokes, presenting a high-impedance path for the interference. There are various ferrite "mixes," each designed to be effective on specific parts of the r.f. spectrum. What you will need are beads that are most effective over the frequency range between 50 and 200 MHz.

*(Editor's Note:* There are some commercial clamp-on filters from Audio Advisor and AudioQuest that may solve your problem, and the MAGIC ground isolator from Mondial has, I am told, been effective when other methods didn't do the necessary job.—E.P.)

Bypass each amplifier output terminal to its chassis, using disc ceramic capacitors of about 50 to 100 pF. Keep the leads as short as you can make them.

Perhaps the amplifier's circuit boards are not well shielded. Some judiciously placed aluminum foil can sometimes create good shielding; be sure to ground the foil. Also, be very careful that the foil doesn't touch and short out any wiring or components.

### Subwoofer Crossover Networks

**Q** *My satellite loudspeakers are fed as full-range systems. Because I love organ music, I also use a subwoofer. I feed this with two active crossover networks in cascade; the first is 18 dB/octave, followed by a*

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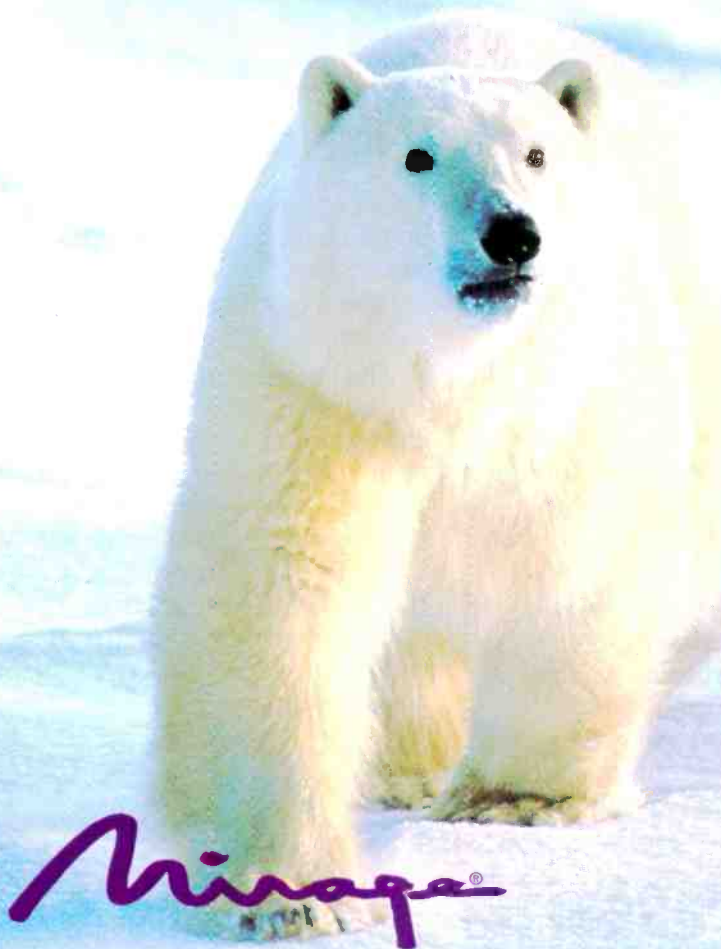
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By Martin Colloms  
Reprinted from  
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February 1994

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By Robert Hartley  
Reprinted from  
*STEREOPHILE*  
Vol. 17, No. 18, August 1994

## audio research

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24 dB/octave unit. The crossover frequency is 50 Hz. I use two networks to obtain a steep slope to avoid interference with the mid and upper bass, such as is evident with a deep male voice. The sound from all this is quite good, but after using an audio-frequency generator and an oscilloscope, I found there was a complete polarity reversal between 20 and 50 Hz. I also found that, when feeding a square wave into the system, an almost perfect sine wave appeared at the output. What suggestions can you make to help improve the performance of what is, even now, a good system?—Ronald N. Leutwyler, Orleans, Mass.

**A** I much prefer using a crossover network having a smaller rate of roll-off than you presently employ. Even with active networks, the extreme amount of roll-off you are using almost certainly must produce some ringing. I am not convinced that the extreme phase shifts in your system won't produce problems in the region of 50 Hz.

If you can manage it, try as little as 6 dB/octave. You won't have nearly as great a phase shift as you now have; you also should have less tendency to "ringing." For this gentle slope to work properly, I suggest you use a high-pass crossover to your satellite speakers. This should remove any "boominess" in the mid-bass. If that condition persists, try crossing the satellites (but not the subwoofer) at a somewhat higher frequency than 50 Hz. If you are still unhappy with the integration between the subwoofer and the satellites, try 12 dB/octave.

I am not too concerned about the square waves you mentioned. Any transient attacks found in bass instruments will be carried by the satellite speakers. After all, if the purpose of a subwoofer crossover is to roll off upper frequencies, that crossover will reduce harmonics—including those which make a square wave square. Remember that your system employs a very large amount of roll-off. You will find that a network having a gentler crossover slope will also produce output that is closer to a square wave when fed a square-wave input.

(Editor's Note: There are some commercial crossovers using the classic Linkwitz-Riley alignment which might improve your performance. However, if you're happy with the audible results, stick with what you've got.—E.P.)

## Measuring and Matching Signal Levels

**Q** Some manufacturers of audio equipment measure input or output signal levels in dB; other manufacturers use volts. How do I use these figures to be sure I don't damage any of my components because of some mismatching of levels?—Gerald E. Fields, Morrow, Ga.

**A** I can appreciate your concern, but you are very unlikely to damage any electronic components, even if you happen to overdrive them. If you do put too much signal into a given piece of gear, you will likely hear audible distortion. You will also find it hard to control sound level with the volume control (if any) in the overdriven component, because the control's action will be crowded into the lower quarter of its range. Reduce the signal before it gets into the next device in line, until the distortion clears up or the action of the volume control is more normal. For components which have no means to reduce output signal level, such as some CD players, there are commercial attenuators you can wire between that component and the next piece of gear in the line.

## Burning In

**Q** What is meant by the term "burn-in"?—Name withheld

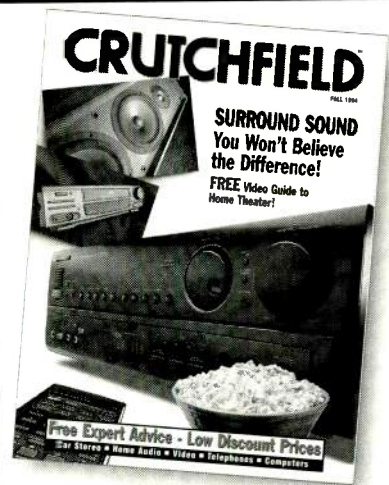
**A** You may have noticed that when electronic equipment breaks down, it usually does so rather soon after you start using it. To make sure you won't have this experience, some manufacturers will "burn in" their equipment before shipping it out, by running it for several hours or even for several days.

Some people feel that a few days of burning in equipment at home, under actual signal conditions, makes it sound better. This is most widely accepted when it comes to amps and their capacitors, but it is also done for speakers, whose materials can often be a bit stiff at first and can limber up after some use.

## Mono VCRs and Stereo Sound

**Q** If I connect the output of a mono VCR into the inputs of a stereo system, can the VHS Hi-Fi track be decoded into stereo?—Steven Matthews, Louisville, Ky.

**A** No. A stereo system can't transform a mono signal into a stereo one. **A**



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## "Man Bites Digital": The Final Chapters?

Dear Editor:

I am writing in regard to the apparently skewed negative responses (May 1994) to Keith Mackenzie's letter, "Man Bites Digital" (August 1993). The letters span the purely technical, mid-philosophical, and purely philosophical, so I assume these are representative of the total responses you received.

I used to be a dedicated digifanatic, and then was coaxed into the analog camp for a while—but after thorough research, I now find myself in the middle, waiting for something better. Here is why:

In digital audio, there are two cornerstones that determine the quality with which the signal is recorded; the first is word length, and the second is sampling rate. The word length determines the S/N ratio, and the sampling rate determines how easily the D/A converter can reconstruct the waveform. For Compact Discs, the word length is 16 bits, and the sampling rate is 44.1 kHz.

The reason so many audio buffs feel that the analog LP is superior to the CD is that the LP was developed to its maximum capability, which was really quite good (keeping in mind that the final sound emerging from our speakers is analog, whether the source is LP or CD). The CD, on the other hand, has the *potential* for superior sound, but the word length and sampling rate are at the lower end of the scale in terms of what is necessary for truly accurate sound reproduction.

Depending on how carefully the digital sound was originally recorded, the CD can end up with some lost bits, for a total word length of 14 bits. A noisy CD results, and I have heard them—even some CDs that have been released on top-brand labels, and supposedly DDD discs. Hiss as loud as, or louder than, that of an analog LP is present on these discs. Moving to a 20-bit word length will help this, for even with lost bits, the S/N ratio should remain at a satisfactory level.

According to the Nyquist theorem, the minimum sampling rate necessary for waveform reconstruction of sampled music is twice the highest frequency that is going to be sampled. The CD sampling rate of 44.1 kHz is just slightly more than twice the 20-kHz cutoff frequency in CDs. Thus, the minimum sampling frequency was chosen, and we now know that increased sampling rates improve the sound quality dramatically.

The bottom line is that current CDs are on the bottom line. Once digital sound is moved to a higher plateau, with 20- to 24-bit word lengths and higher sampling rates, there will be no further dispute as to the superior fidelity of CDs. But for now, there are two crowns worn in the audio world: One is made of vinyl, and the other of polycarbonate.

John E. Johnson, Jr., Ph.D.  
Redwood City, Cal.

*Editor's Reply:* Depending upon how one defines S/N ratio (more about which later), Dr. Johnson is correct when he states that "word length determines the S/N ratio" of a digital system, but he is incorrect in saying that "sampling rate determines how easily the D/A converter can reconstruct the waveform." Sampling rate has nothing to do with playback (signal reconstruction); it applies to the recording side of the equation.

Sampling rate sets an upper limit on the frequency of signals that can be handled by the sampler without "aliasing"—creation of "images" or "aliases" that appear in the sampled spectrum and cannot be distinguished from "true" signals at those frequencies. According to Nyquist, the theoretical limit is one-half the sampling rate, but to achieve that limit requires a non-realizable brickwall filter—one that passes signals from d.c. to half the sampling rate perfectly and totally rejects signals above half the sampling rate. In practice, therefore, the frequency range that a sampler can accommodate is somewhat less than half its own sampling rate.

Note the following:

1. It is the *sampling* process that imposes the bandwidth limitation.

2. The sampling process is not "digital" (numeric), but an analog process that is a necessary precondition for digitization. In other words, present-day A/D converters convert ("digitize") *sequential samples* of analog information.

3. It is the sampling rate of the *sampler* that limits the maximum frequency that can be accommodated *at that point in the signal chain*.

4. By sampling an analog signal at a multiple of the CD rate and using noise-shaped digital filtering, a substantial improvement in A/D linearity and dynamic range can be achieved. Modern A/D converters that use such techniques are far superior to the converters of earlier days. Thus, these modern converters are a major reason for the perceived improvement in CD sound quality *despite the fact that there has been no change in the CD Standard itself*.

Dr. Johnson's statements that "Depending on how carefully the digital sound was originally recorded, the CD can end up with some lost bits, for a total word length of 14 bits" and that "Moving to a 20-bit word length will help this, for even with lost bits, the S/N ratio should remain at a satisfactory level" are incorrect. Each digital word on a CD is 16 bits long—no more, no less. Whether each bit conveys useful information (determined, in part, by the characteristics of the A/D converter in the recorder) and whether all 16 bits are accurately converted from digital to analog (determined, in part, by the characteristics of the D/A converter in the player) may be in doubt, but CDs do not "lose bits" and end up with 14 rather than 16. Since the faults lie not in the CD (or the CD Standard) but in the limitations of the converters, increasing word length from 16 to 20 bits will not help unless and until A/D and D/A converters with more than 20-bit capability are common—*true* 20-bit capability, not advertising hype. At that point, one *might* argue that CD word length is limiting dynamic range, but the practical significance of that is questionable given the background noise levels in which CDs are recorded and reproduced and the maximum sound pressure levels at which we can/should listen.

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Despite the advertising, there's no such thing as a 20-bit CD. However, it is possible to achieve a *perceived S/N ratio equivalent* to that of a digital system with a word length in excess of 16 bits—from a 16-bit CD—by using oversampling and noise-shaping in the recording chain. These techniques do not reduce the total noise energy below that of a 16-bit system (in fact, the total noise energy is almost certain to increase), but the spectral distribution of the noise can be modified so as to make it less audible; i.e., a greater percentage of the noise is shifted into regions in which the ear is less sensitive.

In summary, if Dr. Johnson has heard "Hiss as loud as, or louder than, that of an analog LP . . . present on these discs," the fault lies with the recording A/D converter. (I'm assuming that *all* his CDs aren't hissy; if they are, he'd be well advised to buy a new player!) But here's the flipside of this coin. If Dr. Johnson has heard *any* CD—even a single one—that sounds better than the finest LP he's heard, the case for the CD (and the CD Standard) is proved—for it's impossible for a CD to overcome the theoretical limits of the Standard, but it's mighty easy for a lot of CDs not to come close to reaching their potential.

These comments may help explain why some audiophiles are dissatisfied with the sound of *some* CDs and have come to the conclusion (as Dr. Johnson has) that "the word length and sampling rate are at the lower end of the scale in terms of what is necessary for truly accurate sound reproduction." That statement cannot be justified either in fact or in theory, and no prior analog music recording system for the consumer market has even approached the uniformity of response, absence of distortion, and wide dynamic range that are possible within the theoretical limits of a 16-bit, 44.1-kilosample/second digital system.—E.J.F.

Dear Editor:

As a physicist who has yet to buy a CD player, let me say a few words on behalf of Keith Mackenzie and his letter, "Man Bites Digital." Some of us have clear preferences as to the type of equipment we have in our audio ensembles. For instance, I prefer amplifiers with MOS-FET power transistors to those with bipolar power transistors,

and I believe there are good physical reasons for doing so.

The sound from vinyl LPs can be very good with appropriate playback equipment. The majority of consumers never had good analog disc playback, which is one of the reasons for the quick demise of the LP. Even many of the so-called high-fidelity turntables and phonograph cartridges were never that in actuality. I know this from experience. The majority of equipment sold, as well as the majority of music heard (classical, jazz, rock, pop,

country, jazz-rock, New Age, techno-pop, ad infinitum), can only be described as . . .

Well, let me tell you an elucidating story. Years ago, at a science fiction convention, an irate fan walked up to Theodore Sturgeon and said, "You know, 90% of science fiction is crap." Sturgeon, perhaps one of the great writers in that genre, replied simply: "Yes, 90% of everything is crap." I feel that the late Mr. Sturgeon's remark truly "containeth all."

William Mendoza  
Tallahassee, Fla.

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Jack English, *Stereophile*,  
Vol. 15, No. 7 (July, 1992)



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## Digital Film Sound: When? Where? How Much?

Dear Editor:

I'm writing in regard to E. Brad Meyer's article, "Digital Film Sound: Rated S for Sound" (June 1994). I enjoyed the article because I love when a movie has a fantastic soundtrack and can be played back to its full extent at the theater. Hopefully, this can be reproduced for home theater with the same quality and power. I am an owner of home theater, and this sounds like another great advancement. But how long will I have to wait until I can get my hands on this technology, and will it be affordable?

The systems from Digital Theater Systems, Dolby, and Sony seem fantastic, and with the Klipsch speakers, it makes me want to go see a movie in a theater equipped with this technology. I wonder, what powers those speakers, and how much power does their source put out? Also, how much money would any of these systems cost to install, and how many theaters are or will be equipped with these systems?

Richard Konarski  
Mt. Pleasant, Mich.

*Author's Reply:* Mr. Konarski seems to be asking about four things—namely, digital sources and HPS playback in both theaters and homes. First, the sources: The three digital encoding schemes are slugging it out, both publicly in theaters and behind the scenes in the home market. DTS and Dolby have shown LaserDisc prototypes carrying their digital signals, but in the home market one standard must prevail or all will die, and it's too soon to tell who's going to win.

The HPS-4000 house nearest to Mr. Konarski (the only one in Michigan) is the Bay Theater in Sutton's Bay, a couple of hours away. HPS theater systems use professional BGW power amplifiers; a big one has a total output of 5,800 electrical watts, which translates to around 700 acoustic watts—approximately the sound power of 10 symphony orchestras.

There is a home HPS system that uses Klipschorns as the main left and right channels, and it costs about \$20,000. The theater systems, whose speakers use the same drivers and horns in larger cabinets

(minus the expensive finish), range from around \$12,000 to \$30,000.—E.B.M.

## Praise for Carver Loudspeakers

Dear Editor:

I agree with Edward Tatnall Canby that bass has been overemphasized in the world of audio ("Audio ETC," September 1994). I have found a solution, a speaker that reproduces sound flatly from 20 Hz to 20 kHz (almost). It isn't a single speaker; it is the Carver Amazing Loudspeaker Platinum, actually a "full-range" 60-inch ribbon and four 12-inch woofers. This speaker, when driven with the Carver TFM-75 amplifier or an equivalent, can accurately reproduce any music you throw at it.

The great thing is the bass. It isn't the boomy, muting type heard in home theaters and on lesser speakers, but the smooth, precise sound that only four long-throw woofers can produce. Detail and accuracy are what sets this speaker apart from the average cone, and realism is what separates it from electrostatic and quasi-ribbon speakers. I also have a pair of Carver AL-IIIs with 48-inch ribbons; they are great, and I am currently using them in my home theater.

Incidentally, maybe you can explain the effect I heard the other day when I was watching the LaserDisc of *Star Trek VI: The Undiscovered Country*. I forgot to engage Dolby Pro Logic; I didn't notice until I happened to look down at the receiver a few minutes into the film. I then tested several times to see why the LaserDisc sounded as good in stereo as it did in Dolby Pro Logic. The Carver image is so precise that there is little need for a center-channel speaker, and somehow even the surround information seemed to be coming from the right places! I can't explain it, but I assume this has to do with the bipolar design of the Carver AL-III and the lesser speakers I have in my setup (Boston Acoustics, not bad for bookshelves). Another problem could be with the decoding of my Technics receiver.

Can you imagine a home theater with three Carver Platinitums up front and the AL-IIIs as surrounds?

Steve T. Seitz  
Portland, Ore.

*Editor's Reply:* Without hopping over to Portland and playing with your system,

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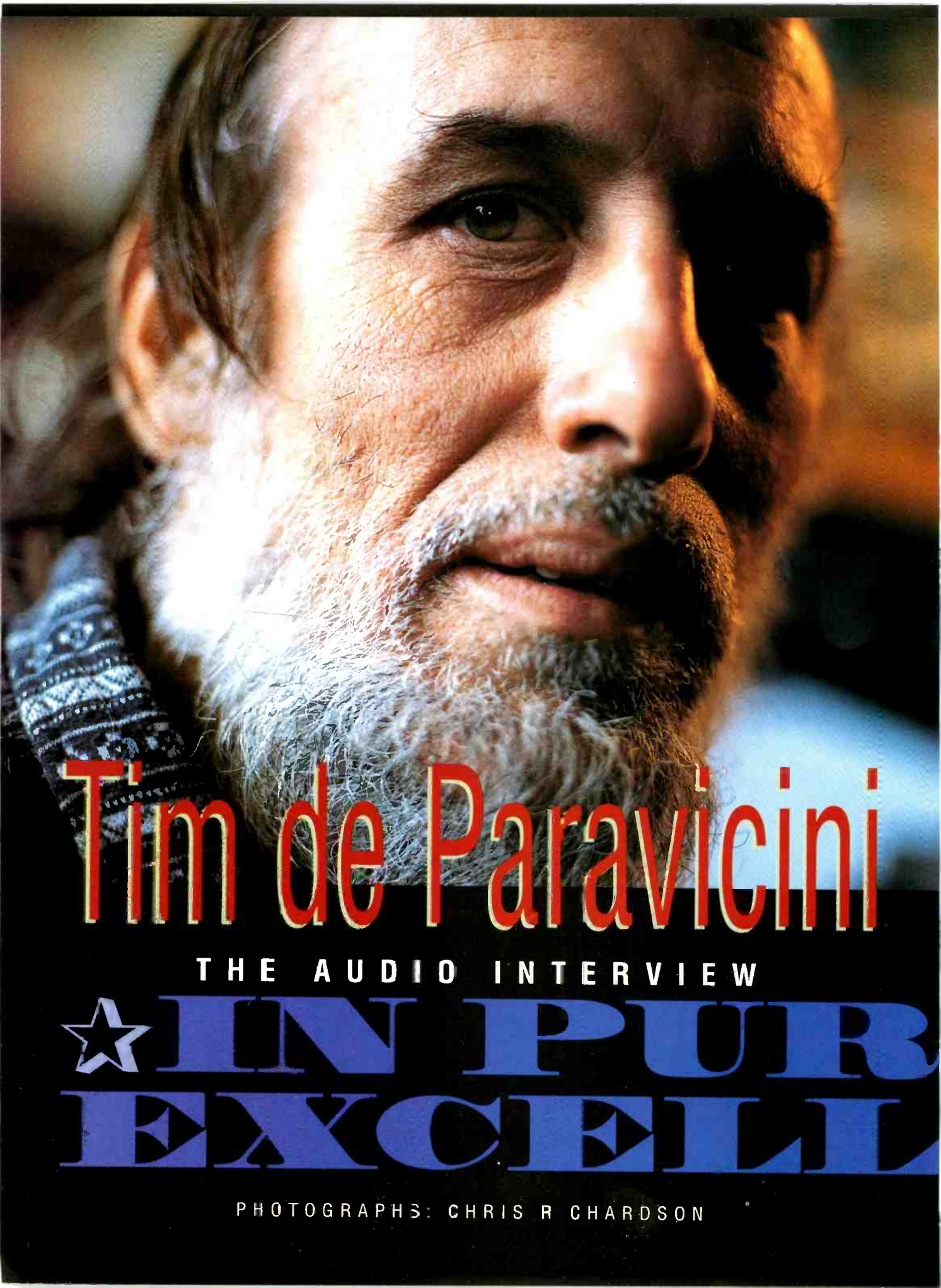
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# Tim de Paravicini

THE AUDIO INTERVIEW



# IN PUR EXCELLENCE

PHOTOGRAPHS: CHRIS R CHARDSON



# h

hidden away in a small company near Cambridge, England, is a man who upgrades analog tape recorders to near perfection. Tim de Paravicini modifies classic tape machines. He reworks them from the ground up, adding new tape heads, tweaking the transport, and replacing the electronics with his own custom tube designs. He also upgrades stereo microphones with special circuitry. And the results are worth it. His customers rave about the beautiful new sound, better than they can get with digital recorders.

An example of the de Paravicini sound is on *A Meeting by the River*, by Ry Cooder and Vishwa Bhatt. The experience of hearing this CD can be startling because of its presence, warmth, and purity. The recording won a Grammy for its engineering by Kavi Alexander of Water Lily Acoustics, an audiophile label. The electronics that contributed to this disc's quality sound are the work of a man with a passion for audio purity that goes beyond digital quality. In fact, de Paravicini has contempt for digital sound as it now exists. He's pushing the envelope far beyond what we ordinarily settle for in CD quality.

If you're fascinated by the search for the ultimate in recording quality, de Paravicini's story of modifications of recorders, consoles, and microphones will interest you, as will his provocative opinions on everything from digital sound to hi-fi "tweaks."

A man of many talents, de Paravicini is well known in esoteric audio circles as an extraordinary designer. While some of his circuit designs are tube and some transistor, all are original. He has been a consultant to Musical Fidelity and Lux Corporation in the design of many of their classic audio components.

Fourteen years ago, de Paravicini founded Esoteric Audio Research. The company makes vacuum-tube products for the high-end audio and pro-audio markets, such as power amplifiers, a microphone, a microphone amplifier, equalizers, and a compressor/limiter. With years of experience in disc cutting, de Paravicini has cut records for Wa-

ter **L**ly Acoustics, Chesky Records, and Island Records. He also improved the performance of several recording lathes.

Although de Paravicini will upgrade any tape machine, his favorite is the legendary Studer C37. "It's a good, reliable workhorse," he says. According to him, the C37 blows away everything else, even an Ampex MR70. The C37's tube circuitry is simple, with no microprocessors to get in the way. Even before the upgrade, the C37's specs are notable. The frequency response is rated as 30 Hz to 15 kHz, +1, -2 dB, and S/N is 75 dB (rms, weighted) at 15 ips. After de Paravicini's modification, the response is 7 Hz to 35 kHz, ±1 dB, and S/N is 90 dB!

One happy user of a de Paravicini tape deck is Chris Rice, owner of Altarus Records, a classical label. Rice had de Paravicini modify three Studer C37s—two 1-inch and one half-inch. "The heads were custom-made to Tim's specifications," says Rice. "The mechanical modifications he did himself. He stripped the electronics out and rebuilt his own circuitry into the existing modules, doing hundreds of modifications. He uses his own EQ curve. He also provides an a.c. mains regenerating power supply because the machines are not quartz locked; they depend on mains frequency. By doubling the capstan diameter, Tim doubled the tape speed from 7½"15 ips to 15/30 ips."

According to Rice, "The new machines are incredibly stable mechanically. They sound fabulous, very quiet and more dynamic. They're very clean and have no grungy noises. With the new Ampex 499 tape, the modulation noise is down so low, you can almost forget about it. It gives you quite a lot of leeway in your recording level. You don't have to worry about compression because these tapes will happily go up to 9 dB over. The tape saturates way before the electronics overload."

Rice notes that his analog decks sound better to him than digital, even without any noise reduction. "They give a more accurate representation of what's coming down the line. That has to be my final criterion: How closely can I capture what's coming in from the microphones?"

Another satisfied user is Sam Rivers, a producer of jazz records. He sent de Paravicini two broken-down Studer

by **BRUCE BARTLETT WITH JENNY BARTLETT**

# SUITS OF FINCH ★

A-80s to modify into a 1-inch and half-inch model. Vince Clark of Erasure also has one of de Paravicini's machines.

Kavi Alexander, the engineer with Water Lily Acoustics, won his Grammy for engineering a Ry Cooder album with a de Paravicini recorder; it was a 1-inch, two-track Studer C37. Alexander used a Blumlein stereo pair of custom microphones, which

**Analog recorders can sound wonderful, but DATs are so portable and convenient.**

Oh, God, I hate DATs. Stopping and starting with those things is a pain in the ass. With an open-reel tape, you can pause it and go instantly; it's human; it's tactile. Whereas DATs stop, fit, fart, and think about what they're going to do—they're just not friendly. And unlike DAT tape,

it will satisfy the hearing mechanism and won't have a digital sound. Digital has a "sound" purely because it is based on lousy mathematics. The manufacturers presuppose too simplistic a view of our hearing mechanism.

But manufacturers don't want to change—it's the lowest-common-denominator syndrome. It's like 525-line television, which allows you only X amount of resolution. With digital, you've fixed your resolution parameters, where analog never had that problem.

I still do work on the vinyl record; it still can be advanced. The number of vinyl molecules passing the needle every second is equivalent to half a gigahertz. So there ain't a lot wrong with it, fundamentally. You can carry on improving it without losing compatibility. It's like good old 35-mm films—you carry on improving films, but there's nothing to stop you from shoving them through the same old projectors!

I've been pioneering work on a CD player that runs at 88k, but it only works with CDs that were cut at 88k.

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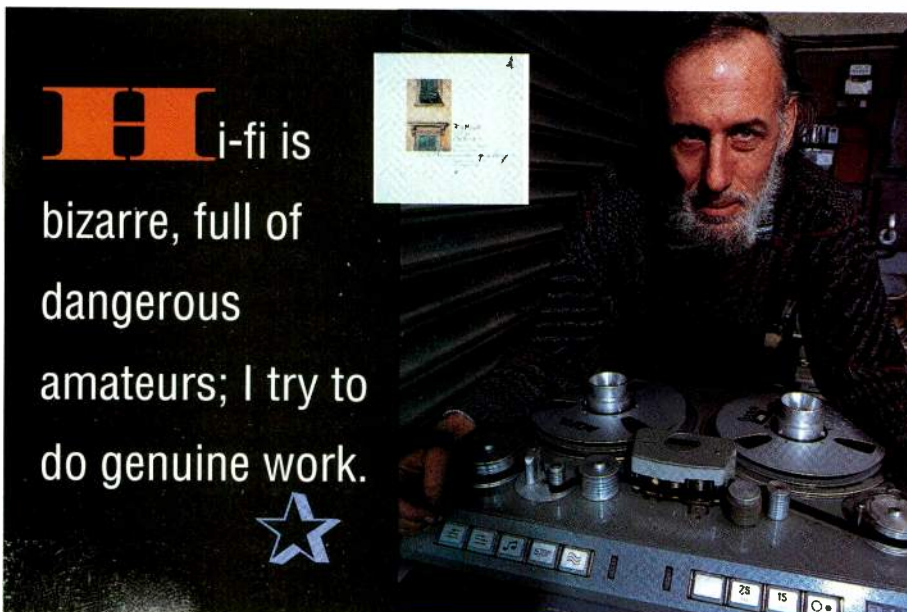
Right. The manufacturers should have said, "Let's go gung ho and create a real system that works right." A 12-inch LaserDisc would have given you an hour's worth of music to the highest standard. Manufacturers try to pretend that what's good enough for Joe Doe at \$5 is the state of the art.

**Getting back to your recorder mods, what transport modifications do you make?**

Whatever makes the system more stable. Actually, wow and flutter is more limited by the tape than the transport. Tape is a mechanically compliant item, and 1-inch tape has much more tape stability and strength than quarter-inch. Yes, the wider tape costs more, but it's a small part of the total project cost.

**How did you first learn about tape-head design?**

I stripped a lot of machines on the market, worked out my own mathematics, and read papers by Jay McKnight, from Ampex, and so on. I ask the tape-head manufacturers, like Saki, to build heads to my specific requirements. I emphasize bass performance and the fineness of the laminations.



was built with rectangular mike capsules by **Mitch and** with tube electronics by de Paravicini.

When I interviewed Tim de Paravicini, I was struck by his strong, original opinions about audio.

**In some circles you have the reputation of a hi-fi tweak.**

I'm not. I'm too academic to get into that. The hi-fi fraternity is bizarre, full of dangerous amateurs. I try to steer clear and do genuinely innovative work—something that's worthwhile.

**What caused you to start modifying recorders?**

I was dissatisfied with their performance. If "line out" doesn't sound like "line in," that's not good enough.

**What's the main advantage of your 1-inch analog recorder over digital recorders?**

The sound quality. My analog recorder has four times the sampling frequency! The bias frequency is 160 kHz. The magnetic-particle flow past a playback head is equivalent to a 24-bit word, which is amazing resolution.

analog 1-inch tape archives beautifully. Some tapes made in 1955 are earthshakingly good. They still sound fresh. But talk to anybody with U-Matic tapes or DATs, and see how well they store. Run a DAT through a machine 20 times, and you're struggling.

**If analog tape sounds so much better than digital, what improvements should be made in A/D, D/A converters?**

First of all, the frequency response should extend from 3 Hz to 50 kHz, because we experience those frequency limits. We are able to detect audio up to 50 kHz. We don't hear it, but we experience it in other ways. I can give you tinnitus very quickly if I run an ultrasonic cleaner at 45 kHz. You are aware that it's on, and your ears ring when it's shut off. On the low end, we detect mechanical vibrations down to 3 Hz. When a marching band walks past you, you feel the drums in your stomach and bones. And that's all part of the sound.

Ten years ago in *Stereophile*, I said that digital was never going to work well in the chosen format. Digital should use a 400-kHz sampling rate and 24-bit words. Then

**Do you recommend using Dolby SR with your machines?**

No. It's unnecessary, and it doesn't work well under dynamic piano conditions. It doesn't encode a control signal, so it can only approximate. The noise floor in my system is limited only by the microphone. You can't hear its tape hiss—just microphone hiss.

**You use vacuum tubes in many of your designs. Some people have said that tubes have euphonic even-order harmonic distortion. Do you rely on this tube nonlinearity to achieve the sound of your mods, or do you always run the tubes in their linear region?**

I do not rely on tube nonlinearity. I don't want a sound in my machines. What comes out must sound the same as what went in.

The "warmth" in a lot of tube electronics is due to their dismal top end, the bad transformers they use, and the loading down of their high-impedance outputs. Because of the output transformer and the feedback used, many tube circuits have a partial bass instability that gives a bloated bass. Any warmth in the tube sound is a defect, but listeners don't want to know that.

I don't have to use tubes in my designs; I only do it for marketing reasons. I've got an exact equivalent in solid state. I can make either type do the same job, and I have no preference. People can't pick which is which. And electrons have no memory of where they've been! The end result is what counts.

Most transistor-circuit architecture was different from tube-circuit architecture, and that's what people were hearing, more than the device itself. The main advantage of tubes is that an average tube has more gain than an average transistor. Second, tubes don't have the enormous storage times of transistors, so they are very fast. Tubes go to 100 MHz without trying.

**Moving on to microphones, your mikes use rectangular diaphragms, tube electronics, and huge transformers. Why?**

A circular diaphragm has one dominant resonant mode. But a rectangular diaphragm does not have the same resonant mode in both axes, so it tends to have a flatter response. Also, a rectangular diaphragm has less off-axis coloration in the horizontal plane than does a circular diaphragm of the same area.

My mikes are transformer-coupled, triode designs. The electronics have a frequency response of 5 Hz to 35 kHz ( $-1$  dB).

I use transformers in my microphones because they can do the job better than anything else. There's no advantage in transformerless circuits because a lot of them can't drive long lines. As long as I know that the electronics of my microphone go from 3 Hz to 100 kHz at the end of 1,000 meters of cable, I'm all right.

Some transformerless mikes have pathetic headroom. Disgusting. We're besotted with this phantom-power philosophy. Most of the mikes draw only 1 damn milliamp at 48 volts, max. That's 48 mW of energy; it doesn't give you a lot of headroom. I want a mike that can shove 3 volts, +12 dBm, down a line, 20 to 20k, boom! Why so much voltage? Suppose you take a capacitor mike that produces 10-mV output with 74-dB SPL input. At 144 dB SPL, the mike will put out over 3 volts.

**You've said that we experience sound down to 3 Hz, and that reproduction down to this frequency is essential. Do studio consoles go down that far?**

No. The average console has all these cumulatively rubbish electronics in it. If you cascade 10 amplifiers, each with a response down 1 dB from 20 Hz to 20 kHz, you end up with a cumulative 10 dB down from 20 Hz to 20 kHz. So you must minimize all degradation. Since I use a lot of transformers in my stuff, each transformer must be very wideband.

Unfortunately, the average manufacturer looks at only one piece of equipment, in isolation. They quote a tape machine as having a response of 50 Hz to 15 kHz,  $\pm 1$  dB, and say that's fine. Yes, in isolation. But not as a cumulative system. Tony Faulkner uses a

mixing console of mine, full of tubes and transformers, but it's vastly flatter than most of the mixing consoles on the market.

**What's your overall design philosophy?**

Audio devices should not have a sound of their own; they should be virtually a black box. The results prove themselves in recordings using my products. They do the job.

Whatever the device is, I look at it and say, can that device be logically improved? Forget about cost. Companies like Neumann charge a lot of money, but I say, could they make that product a little better and charge a little more for it? Try to make things better, whether it's outrageous or not. Somebody will want it and will pay for it.

**Any last words?**

I try to provoke people. I'm sick and tired of the me-too factor, the lemming factor. Just because everybody else wants to jump off a cliff doesn't mean I have to.

Many audio companies tend to rest on their laurels and don't bother to take the next step forward. They should leap ahead instead of staying on the back burner. They have the potential to be stunning. A

## DISCOGRAPHY

The two recordings below, among the finest-sounding available, were made with de Paravicini's modified tape machines and tube microphones.



Ry Cooder/Vishwa Bhatt: *A Meeting by the River*. Water Lily Acoustics WLA-CS-29-CD. Kavi Alexander, producer. (Available from May Audio Marketing, P.O. Box 1048, Champlain, N.Y. 12919; 800/422-7525). This beautiful blend of

Western and Eastern acoustic music was *Stereophile's* Recording of the Month, and was reviewed in April 1993. In my opinion, the highs are especially sweet and gentle. The sound just flows effortlessly into your ears. The only hiss you hear, which is very slight, is that of the microphones.



Ustad Ali Akbar Khan: *Indian Architecture*. Water Lily Acoustics WLA-ES-20. Kavi Alexander and Sallie Reynolds, co-producers. (Available as a double LP from Finch & Marsh, 2457 Cascade Trail, Cool, Cal. 95614; 916/885-2279).

The following four recordings, again with excellent sonics, were mastered by de Paravicini and John Denz at The Exchange on a custom-built, all-tube cutting system designed by de Paravicini.

Ravel: *Daphnis et Chloé*, Boston Symphony Orchestra, Charles Munch. Chesky RC15.

*The Power of the Orchestra/Mussorgsky*, Royal Philharmonic Orchestra, René Leibowitz. Chesky RC30.

Clark Terry: *Portraits*. Chesky JR-2.

Ana Carolina: *Rio After Dark*. Chesky JR-28.



# Build a Class- 100-Watt Mono mp

by dr. norman e. thagard

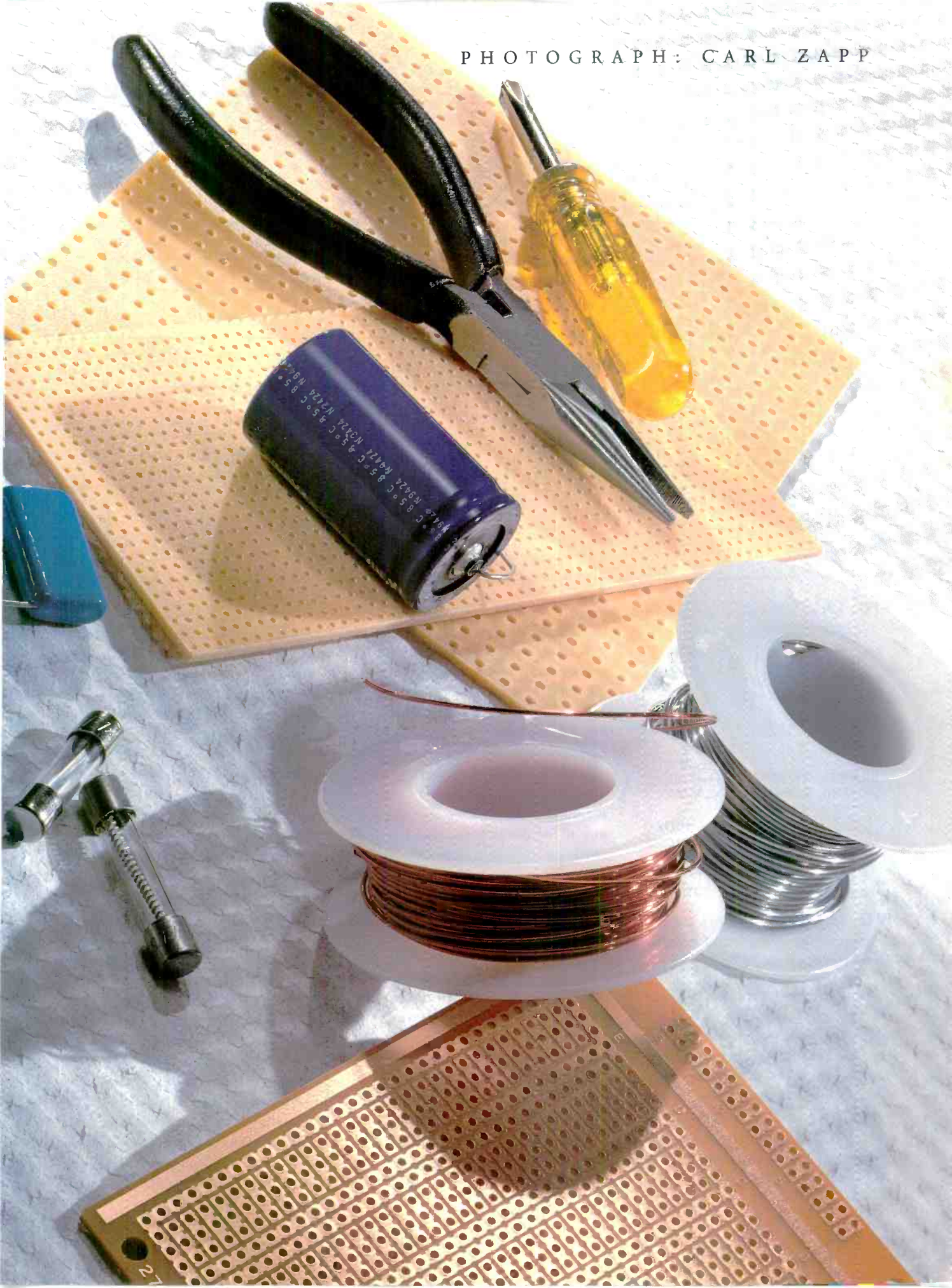
## PART I

If an affordable amplifier possessing characteristics usually associated with the so-called “high end” interests you, please read on. This construction article describes a mono power amplifier whose performance I believe to be exceptional. Although the term “high end” has no precise definition, equipment so classified is generally expensive and represents, in the designer’s view, an uncompromised effort to create a device superior in performance. The latter was certainly my intent, but the price was only a few hundred dollars per channel.

It takes a long string of words to thoroughly characterize the amplifier. How about “bi-FET input, bi-MOS output, cascaded, d.c. amplifier capable of 100 watts pure Class-A operation into 8 ohms at 0.1% or less THD without global feedback”? I might add, “with slew rate greater than 100 V/ $\mu$ S.”

*Norman E. Thagard, M.D., a NASA astronaut, has been selected as the prime crew member for a three-month flight on the Russian space station Mir in 1995. Dr. Thagard served as payload commander for STS-42 aboard the space shuttle Discovery during its 22-orbit flight in January 1992. With the completion of that mission, his fourth, he had logged over 604 hours in space. He has been awarded 11 air medals, including the Navy Commendation with Combat “V” and the Marine Corps “E” award, both while a fighter pilot in the Marine Corps. In addition to his M.D. degree, Dr. Thagard holds bachelor and master of science degrees in engineering science from Florida State University. In his spare time, he enjoys electronic design and has published several articles, including an amp design done with Nelson Pass in Audio Amateur’s 4/92 issue.—Gene Pitts*

PHOTOGRAPH: CARL ZAPP



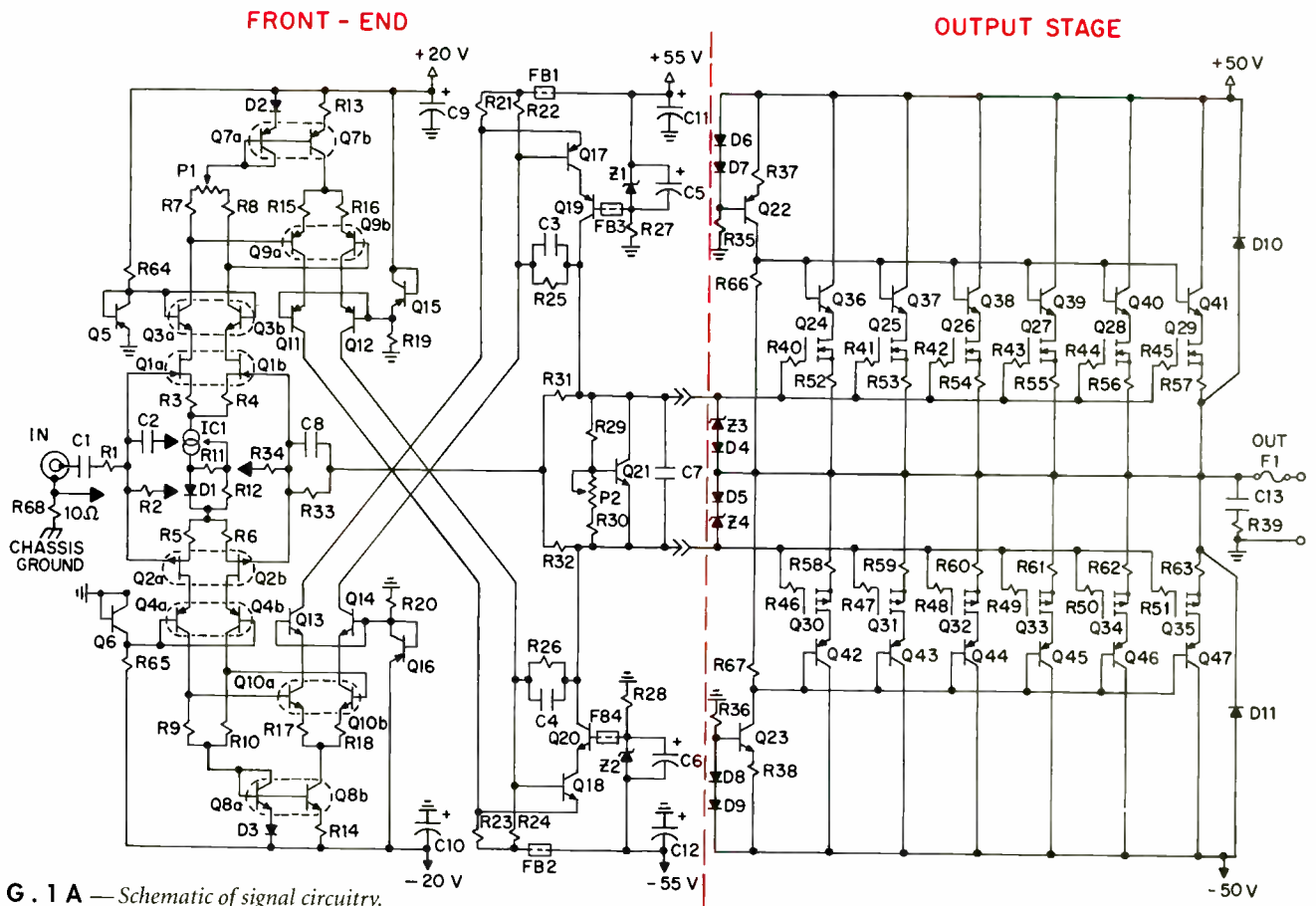


FIG. 1A — Schematic of signal circuitry.

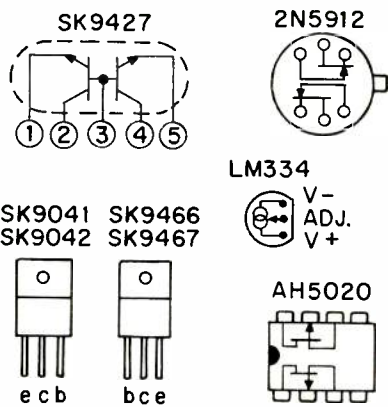


FIG. 1B — Pinouts (top view) of the less common devices used; pinout for SK9428 is identical to that for SK9427.

Let me hasten to mention that I did not pick the topology and then proceed with a design. This project began with a list of design goals, and the topology was chosen as the only straightforward way to meet all of those goals. The goals were: (1) 100-watt pure Class-A operation into an 8-ohm load; (2) THD less than or equal to 0.1% at rated output; (3) low susceptibility to TIM; (4) immunity from load-induced instabili-

ties, and (5) response down to d.c. These goals dictated most of the subsequent design decisions. Invariably, some choices were mandated by such mundane considerations as availability of parts. You might be surprised to learn that not every design choice is critical and absolute, so the designer can be somewhat arbitrary at times. It suffices to say that the resultant design met all five design goals. Since I hope this article can serve as a tutorial for those interested in modern power amplifier design, the whys and wherefores of this particular unit will be explained in some detail.

The requirement for 100-watt pure Class-A operation demands a hefty paralleled output stage with consequent high current demands from the driver stage if the more conventional, bipolar output transistors are used. Unfortunately, a Class-A driver is, in many respects, the most difficult part of the design. An obvious way to gain stability into reactive loads is to avoid global feedback. But this results in increased distortion, which makes goal 2 harder to attain. I found that an output using medium-power MOS-FETs in common

source, together with rugged bipolar power transistors in common base, in a "bi-MOS cascode" was an excellent way to simultaneously meet the first four design goals. Because the driver for such an output sees only the high impedance of MOS-FET gates, it is then fairly easy to develop a Class-A driver capable of slewing an output stage that idles at 2.5 amperes.

The fifth goal, d.c. operation, gave me fits. Those familiar with the thermal drift problems in d.c. amplifiers will appreciate this aspect of the design. I own a Crown DC300 and marvel at its d.c. performance. It uses a bipolar differential input stage operated at a fraction of 1 mA and consequently requires several current-gain stages. Similarly, to achieve acceptably low d.c. drift, I had to operate bipolar input devices at such low bias currents that an extra gain stage was required. Since I am convinced that fewer is often better, I finally abandoned bipolars in favor of J-FETs at the input. No special thermal compensation is employed; nonetheless, drift and offset are quite acceptable for an amplifier intended to reproduce sound.

Building an amplifier with low TIM moves one in the direction of broad open-loop bandwidth and low to moderate levels of global feedback [1]. Lowering global feedback increases THD, which is undesirable. Cascoding both increases bandwidth by lowering the Miller capacitance and lowers distortion by incorporating common-base operation [2]. Therefore, all stages are cascoded.

I owe a large debt of gratitude to Nelson Pass, a highly regarded designer of high-end audio equipment (and my co-author on another design article). He provided both specific critiques and recommendations for improvement of this design and some sage philosophical advice. One such piece of advice concerned parts count and the use of five devices when one would do. (A cascode has a significantly higher parts count than its non-cascoded brethren, but I did not think that I could reasonably meet design goals otherwise. The objective results of wide bandwidth and low distortion found here are undeniable.)

## Circuit Description

Let us begin at the beginning, which is to say, at the input of the amplifier. (See schematic, Fig. 1.) The optional input capacitor, C1, is used to block d.c. The amp is essentially a gain-of-20 voltage amplifier right down to d.c. If your preamp has any d.c. offset at its output, then 20 times the offset voltage will be presented to your speaker. Unless you are sure that your preamp has negligible offset, use capacitor C1; otherwise, simply use a wire shunt across the p.c. board where C1 would normally be placed. On the pattern provided, capacitors of various sizes can be accommodated. Use a good-quality film cap here; the prototype used a polypropylene part. With a value of 3  $\mu$ F, low-frequency cutoff was less than 2 Hz when driven by a 600-ohm source.

The signal source's output impedance combines with resistors R1 and R2 and capacitor C2 to form a low-pass input filter with a cutoff of a couple hundred kilohertz. Historically, I believe such input filters were for r.f.i. protection. This amp has outstanding high-frequency response, so such a filter is well advised.

Resistor R2 sets the input impedance to approximately 50 kilohms. I typically

This  
mp  
design is complex  
where it has to be  
but simple wherever  
SIMPLICITY  
WORKS.

choose this value because it is high enough to preclude loading preamps with even a high output impedance while low enough to minimize stray coupling into excessively high input impedances. I have seen this latter problem occur in digital applications with FET inputs.

The input stage itself is a dual-differential "bi-FET" cascode using roughly complementary p- and n-channel J-FETs in common source with complementary PNP and NPN bipolars in common base. All transistors in this stage are matched dual devices in order to minimize offset and drift. The 2N5912s used for transistor Q1 may be difficult to obtain these days. Two units were constructed using closely matched 2N4391s. These n-channel single J-FETs are widely available and are inexpensive. RCA (in its SK series) as well as other manufacturers of replacement devices offer dual n-channel J-FETs. However, J-FETs with an  $I_{dss}$  greater than 2 mA are required, so check the specs before using a particular transistor. The units using a pair of single J-FETs worked fine.

The first stage's d.c. bias is set to 1 mA by adjusting the monolithic constant-current source, IC1, to 2 mA. Integrated circuit IC1 offers programmable cur-

rent sourcing by selection of R11 and R12. The selected values for R11, R12, and D1 also reduce current variations, which improves d.c. performance. Notice that IC1 is a common current source for both halves of the dual-differential stage. This is made possible because J-FETs Q1 and Q2 are depletion-mode devices, which results in a voltage differential between p- and n-channel sources large enough to permit proper operation of IC1.

The cascode bias is set by the zener-connected transistors Q5 and Q6. I borrowed this idea from Nelson Pass. The NPN MP5A42s and their PNP complement MP5A92s, manufactured by Motorola, used to give a very constant 7 V when so operated. However, the newer MP5A42s no longer give such a voltage, and you may find the specified MP5A92s do not give 7 V either. You can substitute 7-V zeners for Q5, Q6, Q15, and Q16; decrease R19, R20, R64, and R65 to 2.2 kilohms if you make this substitution. Also, bypass the zeners with 10- $\mu$ F, 16-V electrolytic capacitors to minimize zener noise.

The 7-V figure is not critical, but too low a value will impair the input dynamic range and may defeat the cascode. Earlier versions of this design "floated" the cascode bias. While that gave very wide dynamic range and was theoretically superior, it was appreciably more complex. Objective measurements failed to demonstrate an advantage, so the scheme was abandoned. Proper cascode biasing places the J-FETs in their constant-current region. For a solved cascode design example, see [3, in Part II of this article].

Trimpot P1 provides for output offset nulling. Its adjustment range is intention-

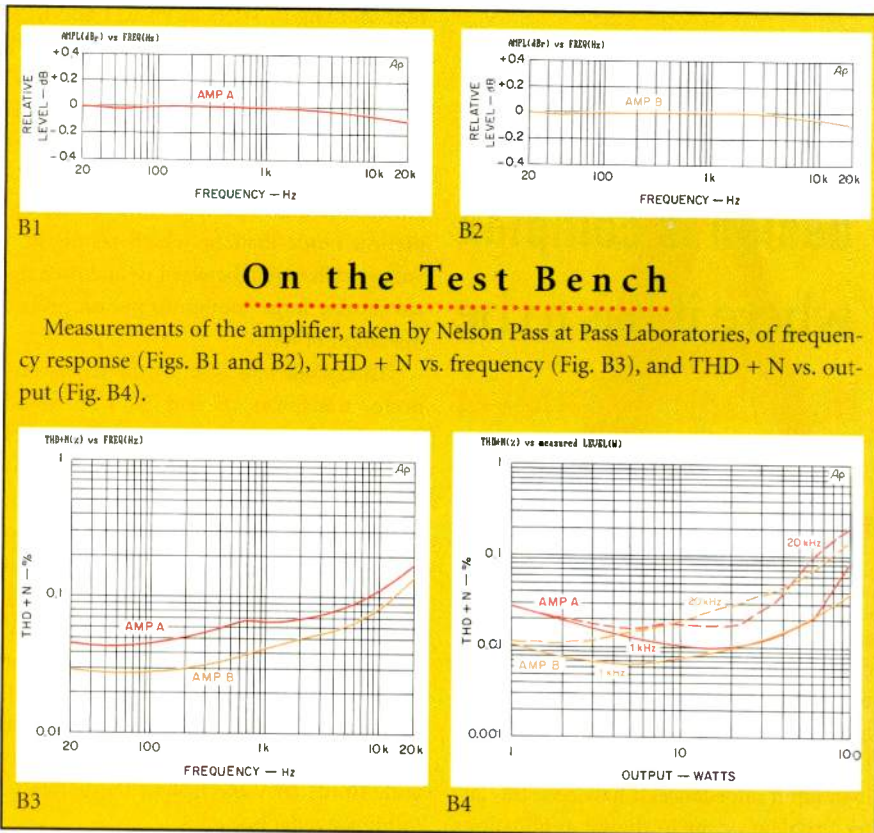


tion.) Transistors Q11 through Q14 perform a d.c. level shift from the 20-V input rails to the 55-V driver rails and therefore have almost 70 V across them.

I realize that some may wonder about the use of separate power rails for input and driver stages. There are, however, advantages which justify this. Operating the input at 55 V would increase the thermal dissipation of that stage, which would degrade d.c. performance. Audio performance can be impaired by signal coupling through the power supply; the separate supply helps with this potential problem. Finally, the 20-V rail is derived from the already regulated 55-V rail via a second voltage regulator, thereby providing the most critical stage with doubly regulated power supplies.

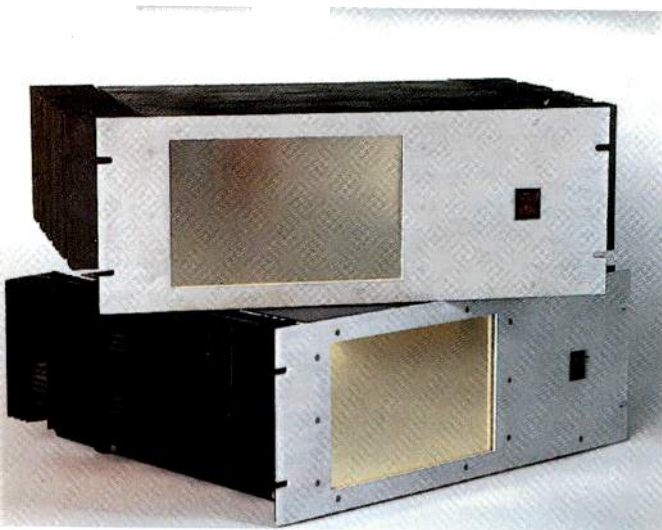
The second stage is again directly coupled to the following one—in this case, the driver. Since the driver supplies most of the voltage gain found in the amp and a fair amount of current gain as well, it is, in many respects, the toughest stage to realize. This stage is, in effect, the output stage of a low-power amplifier in its own right. Because the output uses MOS-FETs in common-source configuration, the driver is spared the necessity of providing several hundred milliamperes, as would be the case if the output comprised bipolar transistors. As has been acknowledged, the gate of a MOS-FET represents essentially a capacitive load. Therefore, drive current needs only to be high enough to charge and discharge that gate capacitance rapidly enough to achieve acceptable output slew rates. Suffice it to say that biasing the driver at about 60 mA gives enough capability to handle the 2-nF load that the output MOS-FETs present to it. The 100-V/ $\mu$ S slew rate is testimony to this!

The drive stage's bias is determined by the voltage across R22 and R24, which is, in turn, set by the 8-mA bias current from the second stage. Thus,  $V_{bias}$  is 2.66 V (0.008 times 332), and R21 and R23 see this 2.66 V less the base-to-emitter voltage of Q17 and Q18 (0.7 V), for a net of 1.96 V. Resistors R21 and R23 are 30.1 ohms; 1.96 divided by this figure yields 65 mA. However, 8 mA of this 65 mA is furnished by the second stage bias, so that driver-stage bias is 57 mA (65 minus 8). Excellent power bandwidth is achieved with this bias level.



## On the Test Bench

Measurements of the amplifier, taken by Nelson Pass at Pass Laboratories, of frequency response (Figs. B1 and B2), THD + N vs. frequency (Fig. B3), and THD + N vs. output (Fig. B4).



An alternate version of the amp, without meters and using commercial heat-sinks, built by a friend of the author.

ally small so that the chance of inadvertently causing large offsets is lessened. If the offset could not be nulled with P1, it would be a clue that something is wrong.

The first stage's output is directly coupled to the second stage, which is also a dual-differential arrangement. Cascading (not cascoding) differential stages has advantages for thermal stability, since drifts in earlier stages tend to cancel out

[4]. The disadvantage is an increased parts count, but this d.c. stability is important enough to justify the complexity in a largely no-compromise effort.

The second stage is d.c. biased by a nice scheme: The 2 mA generated in the first stage by IC1 is run through diodes D2 and D3 to create a 0.7-V reference for the constant-current-configured transistors Q7b and Q8b. Resistors R13 and R14 are 43 ohms, so the current sources generate 16 mA (0.7 divided by 43), or 8 mA through each leg of the differential pair. Since Q7 and Q8 are dual devices, they should perform well as constant current sources.

The common-emitter transistors, Q9 and Q10, of the second-stage cascode are again matched duals to lower drift. However, that consideration is not as important in this stage, and the common-base devices, Q11 through Q14, are not duals. (Indeed, I could find no dual devices with the voltage and power ratings required in this applica-



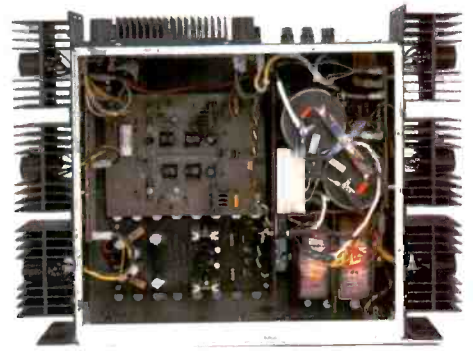
# The second stage is, EFFECTIVELY, a small power Amp in its own RIGHT.

Zener diodes Z1 and Z2 provide cascode bias for the driver stage. Capacitors C5 and C6 help reduce the noise inherent in zener operation.

The ferrite beads, FB1 through FB4, are essentially small, lossy inductors. Their use nicely tamed some high-frequency oscillations which were present. Such oscillations

are not unusual in extended bandwidth designs but would be unacceptable if unsuppressed. A major advantage of the beads is that they can obviate the need for bandwidth-robbing capacitors; a potential disadvantage is that their saturation can produce distortion. Current levels through these beads are too small to cause a problem here.

The voltage gain of the driver cascode was 1,600. This was so high that compensating the closed-loop front-end and still having any bandwidth remaining was a problem. In keeping with the theme of only low to moderate levels of open-loop gain, R25 and R26 were added to provide local feedback. With their addition, the driver stage's gain then becomes roughly 100 (the value of R25 divided by the value of R22 or, similarly, R26 divided by R24). With the reduction in gain realized with local feedback, the small capacitors C3 and C4 were all that were required to compensate the closed-loop front-end. With the 47-pF caps used, open-loop bandwidth was well in excess of 20



kHz, the design goal set to preclude TIM. Open-loop voltage gain was about 56 dB, a good level.

Further installments of this article will cover the power supply, the output stage, construction methods, and the amp's operation. A complete Parts List and references will be provided. A

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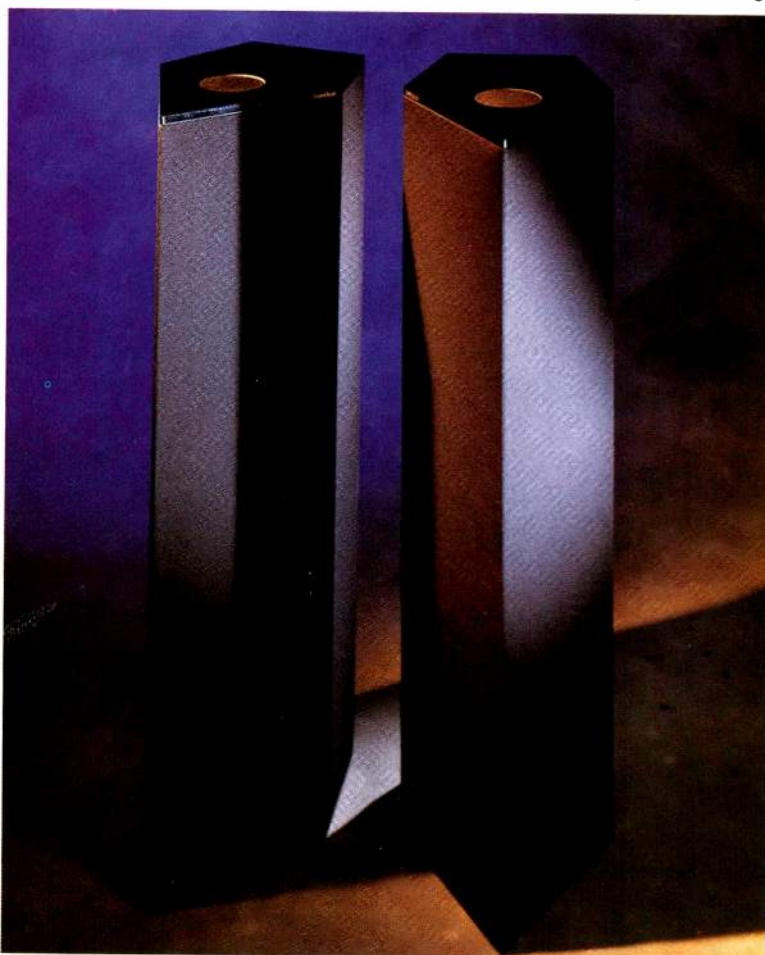


# SOUNDWAVE POINT SOURCE 3.0 SPEAKER

**V**ero Research manufactures loudspeakers for the home market and studio monitors for recording studios under the brand name Soundwave, and has been in business since 1987. The company's founder, James Gala (now its technical director), conceived and now holds a patent on a unique series of loudspeakers whose cabinets are "V"-shaped, with the point (apex) of the "V" facing the listener.

The Point Source 3.0 closely follows this style by mounting two 8-inch woofer/midrange drivers on either side of the narrow "V," with one mounted higher than the other to prevent interference between the magnets. A small, forward-facing tweeter is mounted at the point of the "V," vertically centered between the larger drivers. An additional tweeter is mounted on the top of the cabinet, facing upward. The Point Source 3.0 is second from the top of a series of four systems which range in price from \$1,490 per pair, for the smaller three-driver Point Source 1.0, to \$3,490 per pair for the largest Point Source 4.0 six-driver system.

Why mount the drivers in the "V" configuration? According to Gala, this mounting arrangement packs the drivers in the closest possible space, and thus provides a coincident and coherent point source that provides optimum, even coverage in the front hemisphere of the system. The in-



cluded angle of the "V" is a narrow 64°, which means that the effective width of the two bass/midrange drivers is only slightly wider than one unit. Gala describes this arrangement as a new variation of the D'Appolito configuration (a vertical array formed by a tweeter flanked by two larger drivers), which provides symmetrical, even vertical coverage. A conventional D'Appolito configuration using 8-inch drivers

might, however, have too little vertical coverage; Gala's variation avoids this problem coverage because the two larger drivers are effectively mounted closer together vertically.

Gala states that the "V" design offers improvements in stereo imaging and tonal accuracy by reducing high-frequency beaming and by minimizing reradiated sound from adjacent cabinet surfaces. Any reradiation that does occur is directed off to the side and away from the listener, and thus is less audible.

Gala further states that the "V" design allows the enclosure and drivers to approximate a true point source, yet also allows the cabinet to be large enough to house drivers of sufficient acoustic output to reproduce music at live performance levels.

The Point Source systems were designed to provide even coverage in the full front hemisphere (180°), and not just in a narrow angle directed toward the listener. This is a direct result of the extreme narrowness of the front of the "V"-shaped enclosure. An additional tweeter is used, to improve power response at high frequencies. To minimize rear-wall bounce, this tweeter is top-mounted and aimed straight up at the ceiling. According to Gala, the top tweeter improves high-frequency coverage, especially for listeners who are standing close to the system.

In summary, Gala says that his goal with the Point Source systems is to "have

the seamless sound of the highest quality two-way designs, the acoustic output and power handling of three-way designs, and a radiation pattern superior to both.”

The enclosure of the Point Source 3.0 is completely filled with acoustic foam and has a rear-mounted circular port. This speaker can be converted back and forth from a closed-box to a damped vented-box system, by removing or inserting a supplied rubber plug. The cabinet of the Point Source is well braced, while the unique shape minimizes internal standing waves. All panels are 3/4-inch medium-density fiberboard. Construction is excellent, and tolerances are tight. Except for the top, the whole cabinet is covered with black grille cloth. The grille cloth can be easily rolled down the outside of the cabinet in order to reveal the drivers; this is done by removing the top plate (which is attached by pegs and plastic hook-and-loop fasteners), un-

## SPECS

**Type:** Two-way, floor-standing system with point-source drive unit geometry and convertible, vented/sealed, enclosure.

**Drivers:** Two 8-in. cone woofers, one 1-in. neodymium-magnet fabric-dome tweeter, and one top-mounted 1-in. ferrite-magnet fabric-dome tweeter.

**Frequency Response:** 34 Hz to 20 kHz,  $\pm 3$  dB.

**Sensitivity:** 90 dB at 1 meter with 2.83 V rms input.

**Crossover Frequency:** 2.2 kHz.

**Impedance:** 5 ohms nominal, 4.7 ohms minimum.

**Recommended Amplifier Power:** 50 to 300 watts per channel.

**Dimensions:** 42 in. H x 12 in. W x 17 in. D (106.7 cm x 30.5 cm x 43.2 cm).

**Weight:** 60 lbs. (27.3 kg) each.

**Price:** \$2,490 per pair; available with high-gloss black acrylic top panel and black grille cloth or with white top and white grille cloth.

**Company Address:** c/o Vero Research, 1150 University Ave., Rochester, N.Y. 14607.

For literature, circle No. 90

loosening a draw string, and then pulling down the cloth. Both spikes and rubber feet are provided for attachment to the bottom of the cabinet.

The 8-inch bass/midrange drivers of the Point Source have an extremely overhung voice-coil, 21 mm (0.83 inch) long, for large excursion. The small-diameter front tweeter has a vented high-energy neodymium magnet with a composite fabric dome. The vent leads to a sealed felt-filled air chamber that lowers the fundamental resonance of the tweeter to below its operating range. The top tweeter is of similar design but uses a ferrite magnet.

The crossover is a simple, straightforward design and includes a first-order low-pass filter with impedance compensation for the woofer, and a second-order high-pass on the tweeters. A three-position, heavy-duty rotary switch on the rear panel provides  $\pm 1.5$  dB of tweeter-level adjustment. The top tweeter is driven through a series resistor to slightly attenuate its level. The crossover contains nine components (five resistors, two inductors, and two capacitors). The parts are mounted on a heavy p.c. board attached to the rear input connection panel. High-quality Solen capacitors are used, as are air-core inductors. The heavy-gauge connecting wire is attached to the p.c. board with an industrial-grade, automotive-style multi-pin connector. The system can be bi-wired and includes two large double-banana gold-plated connectors, with straps, on the rear panel.

### Measurements

The anechoic frequency responses of the Point Source 3.0, with the port open and closed, are shown in Fig. 1. Measurements were taken at a distance of 2 meters on the front tweeter's axis, with an input of 5.66 V rms. The curves are referenced back to 1 meter and are 10th-octave smoothed. The response shelves

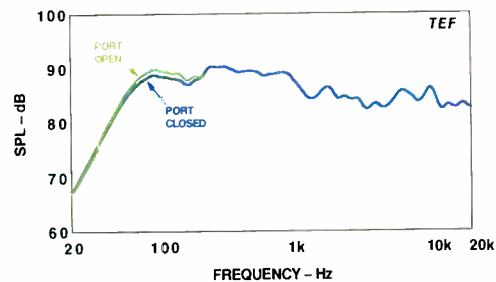


Fig. 1—One-meter, on-axis frequency response.

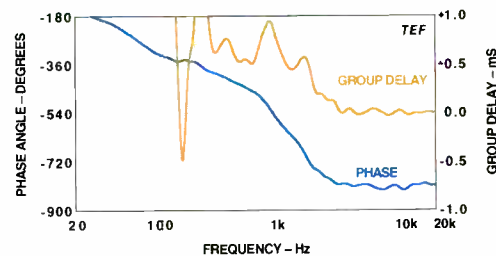


Fig. 2—On-axis phase response and group delay.

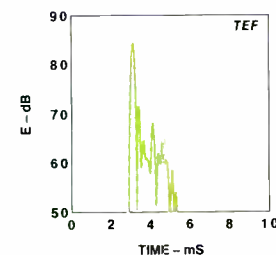


Fig. 3—Energy/time response.

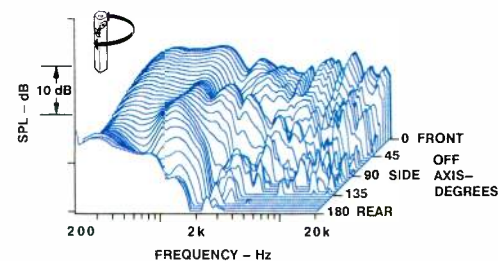


Fig. 4—Horizontal off-axis frequency responses.

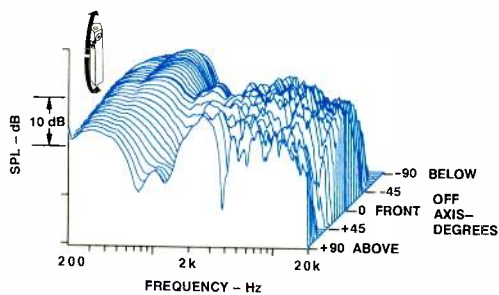


Fig. 5—Vertical off-axis frequency responses.

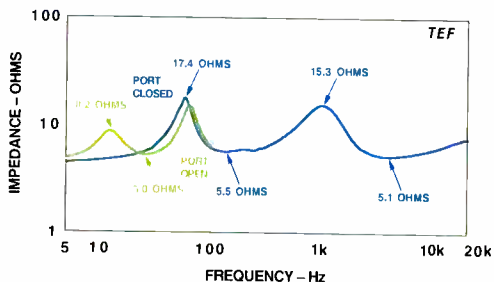


Fig. 6—Impedance.

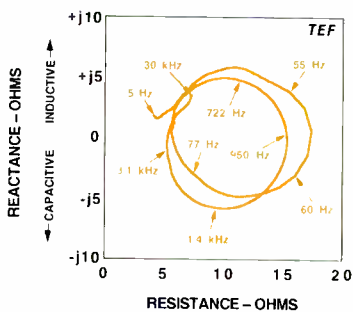


Fig. 7—Complex impedance.

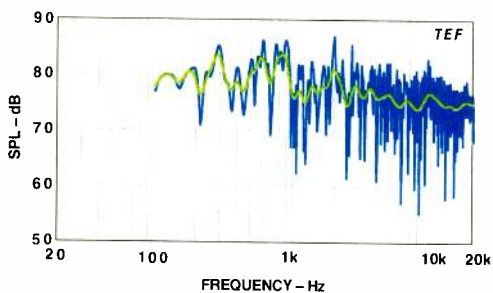


Fig. 8—Three-meter room response.

downward above about 1 kHz, with the level dropping about 4 to 5 dB. Individually considered, the responses above and below 1 kHz are each quite flat and well behaved. Even with the shelving, the overall curve fits a fairly tight, 7-dB window (approximately  $\pm 3.5$  dB referenced to 1 kHz), with a quite respectable bandwidth of 45 Hz to 20 kHz.

With the port open, the response exhibits a slight increase in output, averaging about 0.75 dB, over a broad range from 32 to 180 Hz. The grille cloth did not affect the response much at all, causing only slight,  $\pm 1$  dB variations in narrow frequency ranges. All further tests were done with the grille installed. Averaged over the range from 250 Hz to 4 kHz, the sensitivity of the Point Source 3.0 measured 87.0 dB, about 3 dB below Vero's 90-dB rating. Above 1 kHz, sensitivity was even lower, averaging about 84.5 dB. The right and left units were matched within a close  $\pm 0.8$  dB. The three-position sensitivity switch caused about a  $\pm 1.5$  dB change above 3 kHz (response not shown).

The phase and group-delay responses of the Point Source 3.0, referenced to the tweeter's arrival time, are shown in Fig. 2. The phase rotates about  $235^\circ$  between 1 and 3 kHz, quite a narrow range of frequencies. This rapid rotation is due primarily to the relatively large physical offset between the tweeter and bass/midrange drivers, and to the crossover. (The dust caps of these drivers are about 5 inches behind the mounting plane of the tweeter.) The group-delay curve indicates that the midrange lags the tweeter by a significant 0.5 to 0.75 mS. The large dip in the group delay, at about 160 Hz, corresponds to the effects of a minimum-phase dip in the frequency response at the same frequency. If frequency response was equalized flat in this range, the group-delay dip would disappear.

Figure 3 shows the axial energy/time response. The test parameters accentuate the response from 1 to 10 kHz, which includes the crossover region. The main arrival, at 3 mS, is quite compact but is followed by several relatively high-level narrow peaks, only 13 to 18 dB down, which extend out to about 1.5 mS behind the main peak.

Figure 4 shows the horizontal "3-D" off-axis responses; the bold curve at the rear of the graph is the on-axis response. Because the on-axis response ripples mostly carry over into the off-axis curves, the horizontal coverage is quite good. However, some narrowing of coverage is evident in the range from 1.25 to 2 kHz (not clearly shown in the graph), due to the laterally separated bass/midrange drivers. This narrowing causes an 8-dB dip, two-thirds of an octave

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wide, in the response at  $40^\circ$  off the horizontal axis. In the primary listening window,  $\pm 20^\circ$  of the axis, the narrowing is not significant.

The vertical "3-D" off-axis curves of the Point Source 3.0 are shown in Fig. 5. The bold curve in the center of the graph (front to rear) is on-axis response. Clearly seen in the set of curves is the elevated response below 1 kHz, which carries over to all the off-axis curves in the form of interference dips. In the primary vertical listening window,  $\pm 20^\circ$  of the axis, the response is quite uniform. The output of the top-mounted tweeter is clearly shown in the elevated high-frequency response, which rolls off from on-axis to  $45^\circ$  above axis but begins rising again as the angle shifts toward  $+90^\circ$ .

In general, although the horizontal and vertical off-axis responses of the Point Source 3.0 in the primary listening window are very uniform, responses farther off axis in both planes exhibit significant dips between 1 and 2 kHz. This indicates that the power response is attenuated in this range.

Figure 6 shows the impedance, from 5 Hz to 20 kHz, with the port open and



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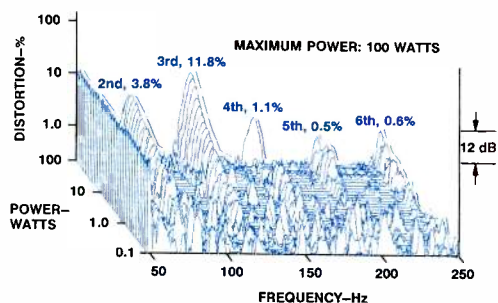


Fig. 9—Harmonic distortion for  $E_1$  (41.2 Hz).

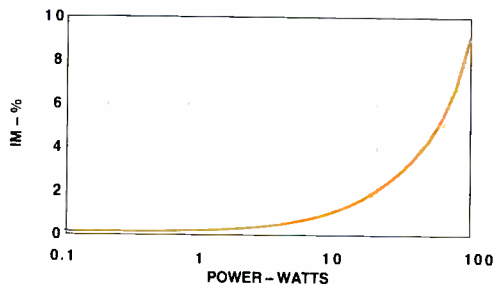


Fig. 10—IM distortion for  $A_4$  (440 Hz) and  $E_1$  (41.2 Hz).

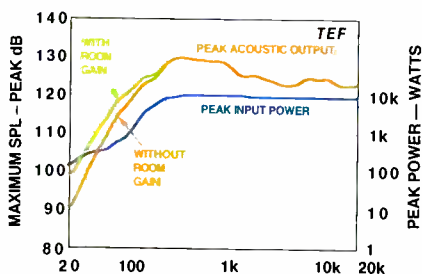


Fig. 11—Maximum peak input power and sound output.

with the port closed. The impedance does not drop below a safe 5 ohms at any frequency. The maximum impedance, 17.4 ohms, occurs at about 57 Hz, the closed-box resonance frequency with the port closed. The low impedance between 20 and 35 Hz with the port open indicates a broad vented-box tuning. The impedance has a max/min variation of about 3.5 to 1 (17.4 divided by 5). Cable series resistance should be limited to a maximum angle of about 0.080 ohm to keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. For a typical run of

about 10 feet, cable of 16 gauge or larger should be used.

Figure 7 shows the complex impedance of the Point Source 3.0, from 5 Hz to 30 kHz, with the port closed. Most activity takes place at the closed-box resonance of 60 Hz in the bass range, and at the 1-kHz impedance peak just below crossover. The impedance phase (not shown) reached a maximum angle of  $+31^\circ$  (inductive) at 45 Hz and a minimum of  $-36^\circ$  (capacitive) at 1.6 kHz. A single Point Source 3.0 per channel will be no problem for any amplifier.

A high-level sine-wave sweep revealed a quite rigid cabinet with no significant vibrations. The 8-inch woofers have a healthy maximum travel capability of about 0.65 inch, peak to peak. Higher excursion generated only high third-harmonic distortion but with no bad sounds. No dynamic offset was evident at any input level or frequency.

With the port open, the excursion of the woofers was reduced somewhat over a broad range, 20 to 70 Hz. No definite null was evident. The maximum excursion reduction from opening the port was about 15% at 40 Hz. When open, the port generated significant wind noises at high input power levels, from air turbulence.

Removing the rear connection panel revealed that the bottom fourth of the cabinet is dead air space. A full partition exists about 12 inches above the bottom.

The 3-meter room response of the Point Source 3.0, with both raw and sixth-octave smoothed data, is shown in Fig. 8. The speaker was in the right-hand stereo position, aimed at the listening position, with the test microphone placed at ear height (36 inches) at the listener's position on the sofa. The system was driven with a swept sine-wave signal of 2.83 V rms, corresponding to 1.6 watts into the rated 5-ohm load. The direct sound and 13 ms of the room's reverberation are included.

Overall, the averaged curve does not exhibit any large deviations in response over

the whole measured range. Notably absent are any major dips in the floor-bounce region, from 200 to 700 Hz. Above 1 kHz, the overall curve exhibits a downward tilt of about 4.5 dB per decade, or about 1.3 dB per octave. The whole curve fits within a fairly tight, 10-dB window.

Figure 9 shows the  $E_1$  (41.2-Hz) bass harmonic distortion spectrum of the Point Source with input power ranging from 0.1 to 100 watts (22.4 V rms into the rated 5-ohm load). The second harmonic reaches only 3.8%, while the third reaches a moderate 11.8% at full power. Higher harmonics are 1.1% and lower. With a 100-watt input, the system reached a quite usable 98 dB SPL at 1 meter, at 41.2 Hz.

The  $A_2$  (110-Hz) and  $A_4$  (440-Hz) harmonic distortion data is not shown because it reached only low values of 1.1% second harmonic at 110 Hz, and 0.6% second at 440 Hz, at full power. Higher harmonics, at both frequencies, were below the noise floor of my analyzer. The Point

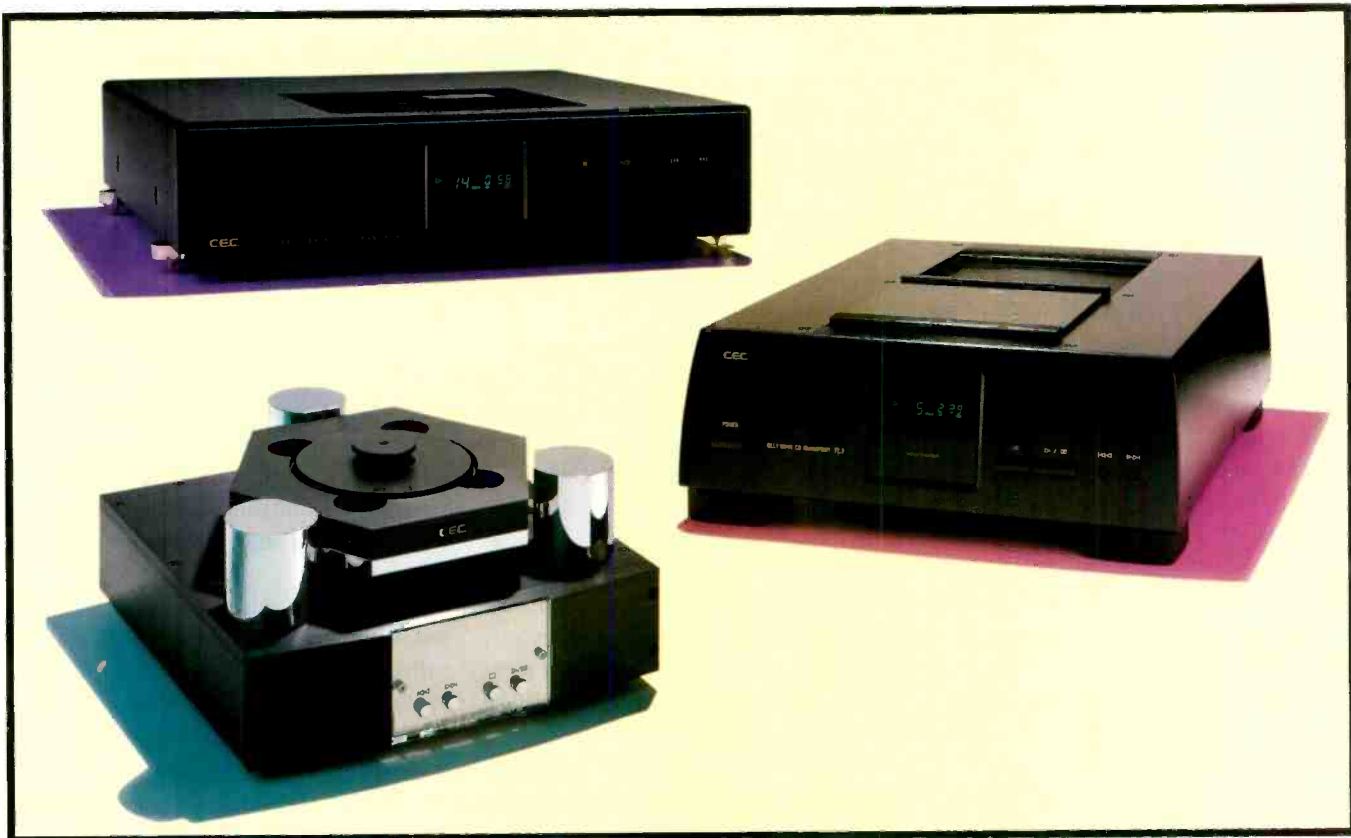
**ONLY ONE OTHER  
SPEAKER THAT I HAVE  
TESTED CAN MATCH  
THE SOUNDWAVE'S  
PEAK POWER HANDLING.**

Source 3.0 sounded quite clean at all three test frequencies at full power. It could actually handle 30 V rms at 20 Hz and above (20 V rms at 16 Hz) in the woofers' range, with the port open or closed, without making any bad sounds or being harmed! This is the second highest bass and sub-bass power handling that I have measured on any system.

Figure 10 displays the IM created by tones of 440 Hz ( $A_4$ ) and 41.2 Hz ( $E_1$ ) of equal power, covering the range from 0.1 to 100 watts. The IM distortion reaches only a moderate 9.1% at 100 watts. This is a relatively low measurement for a two-way system.

The short-term peak power input and output capabilities, as a function of frequency (measured using a 6.5-cycle, third-octave bandwidth tone burst), are shown in Fig. 11. The peak input power was calculated by assuming that the measured





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peak voltage was applied across the speaker's rated 5-ohm impedance.

The peak power handling starts out at a very strong 116 watts at 20 Hz, rises quickly to 1.5 kW at 100 Hz, and reaches a plateau of 10 kW ( $\pm 223$  V, peak, into the 5-ohm load) above 300 Hz! (Wow! Another 10,000-watt system! The Soundwave essentially ties the other all-time winner of the peak-power sweepstakes, the PSB Stratus Gold system reviewed in the November 1991 issue.) No problems were evident at any frequency.

With room gain, the maximum peak output SPL of the system starts at a very strong 99 dB at 20 Hz, and rises rapidly into the range from 120 to 130 dB above about 100 Hz. With an amplifier having sufficient peak-power capability, the Point Source will have no problems re-creating the peak SPLs of live instruments in a typical listening room. In the bass range, 110 dB is attained at 40 Hz and 120 dB is reached at 75 Hz. This places the Point Source in the top third of all the systems I have tested for peak bass output capability.

#### Use and Listening Tests

The Point Source 3.0s have a very distinctive, angular look. When set up for listening, the narrow, pointed front baffle is like a large arrowhead pointed straight in your direction. There is no doubt where you need to sit—that is, until you turn the speakers on and do some listening, either seated or while walking around, and discover that the coverage is quite broad both vertically and horizontally. The Soundwaves still sound good even if you walk between and around them; there is no loss of highs. The top-mounted tweeter really pays off here. This tweeter also adds a certain amount of sheen and airiness to high frequencies, especially percussion such as hi-hat cymbals, even when you listen sitting down and on axis.

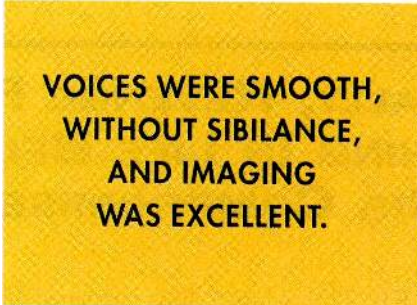
Listening equipment included my usual Onkyo and Rotel CD players, Krell KRC preamp and KSA250 power amp, Straight Wire Maestro cabling, and the B & W 801 Matrix Series 3 speakers. Listening was primarily done with normal, not bi-wired, connections. All listening was done with the grille cloth on.

Vero Research suggests that the Point Source systems be placed 0.5 meter or

more from the rear wall and at least 1 meter from the side walls of the listening room. I placed the systems in my customary locations, which spaced them about 8 feet apart and well away from the side and rear walls. Listening was done from my couch, 10 feet away. The systems were canted in so that I was on axis when seated in the center of the couch.

The instruction manual for the Point Source 3.0 is quite brief, a single 8½ x 11-inch page, folded. Areas covered include electrical connections, loudspeaker placement, use and listening, care and cleaning, and service.

First listening was done with the sampler tracks on *The Sheffield XLO Test & Burn-in CD* (Sheffield Lab 10041-2-T). The Point Sources acquitted themselves very well, particularly in the previously mentioned high-frequency area, but also in bass, where the reproduction of the kick drum on the sampler's Michael Ruff and



**VOICES WERE SMOOTH,  
WITHOUT SIBILANCE,  
AND IMAGING  
WAS EXCELLENT.**

Pat Coil pop tracks was quite clean, dynamic, and satisfying.

The Point Sources were essentially equal in sensitivity to my reference B & W systems. The tonal balance was different, however, with the Soundwaves tilted down somewhat in treble and up a bit in bass. Their subterranean bass response was not the equal of the B & Ws', but the rest of the bass was very close in dynamics, cleanliness, and loudness capability. Played at high levels on pop material, such as Genesis' *We Can't Dance* (Atlantic 7 82344-2), and cleanly recorded country, such as Joe Diffie's *Third Rock from the Sun* (Epic EK 64357), the Point Source loudspeakers were very involving and dynamic. They produced impressive levels of tight, danceable low end.

The low-end capability and bass power handling of the Point Source 3.0s were up there with the best of the systems I have listened to. Very demanding material, such as

the bass drum on *Winds of War and Peace* (Wilson Audio WCD-8823) and the pedal notes on Jean Guillou's organ version of *Pictures at an Exhibition* (Dorian Recordings DOR-90117), were handled very cleanly and without a whimper at quite high playback levels. As I said, the very low bass output did not equal that of the B & Ws, but the Point Sources did produce very satisfying levels of clean bass.

With period, a cappella liturgical music on *Psalms et Cantica* (Sony Vivarte SK 53 977), the Point Source 3.0 speakers exhibited a quite smooth vocal sound, with no exaggerated sibilance, coupled with excellent imaging and reproduction of hall reverberation.

On the pink-noise stand-up/sit-down test, the Point Source 3.0s did exhibit significant midrange tonal changes. Tonal changes were also evident when I moved back and forth in front of the speakers. The coverage was very broad, however, with no lack of highs, thanks to the top-mounted tweeter. The Soundwave's spectral balance on pink noise was slightly depressed in highs and accentuated in lows, as compared to the B & Ws'. Some tonality was also evident in the noise, which indicates a lack of smoothness. On third-octave band-limited pink noise, the 3.0s generated some 25-Hz low-bass output, somewhat more usable output at 31.5 Hz, and very good output at 40 Hz and above. Port wind noise was noticeable from 20 to 40 Hz.

On Prokofiev's *Piano Concertos Nos. 1, 3, and 5* (Sony Classical SK 52483), the Point Source 3.0s did very well reproducing the dynamics and attack of the piano while demonstrating very good soundstaging. They were somewhat more distant sounding than the B & Ws, however. Female classical vocals were reproduced quite cleanly and with clarity.

On balance, the Point Source 3.0's favorable attributes—such as bass response, imaging, high-frequency coverage, and dynamics—far outweigh such unfavorable ones as a somewhat uneven vertical and horizontal coverage and slightly tilted-down response. At \$2,490 per pair, the Point Source has some stiff competition. Do give these speakers serious consideration, however, particularly if you like their very distinctive, angular looks and many positive characteristics. *D. B. Keele, Jr.*

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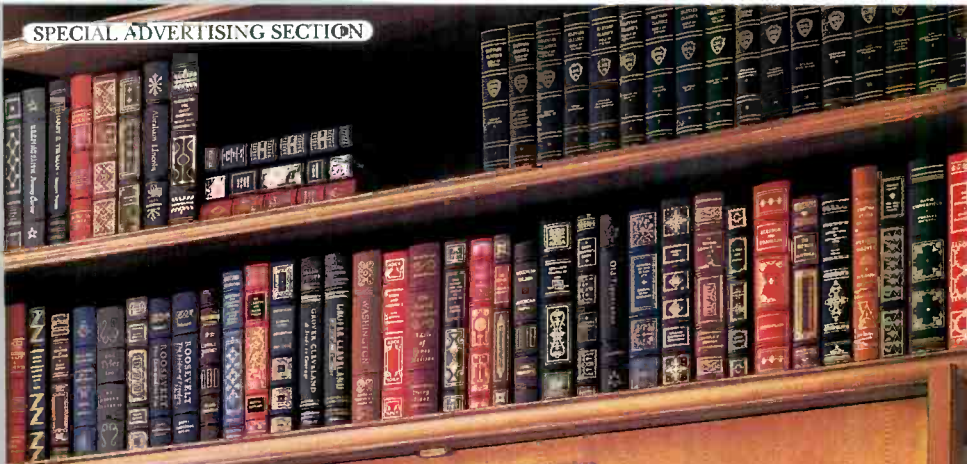


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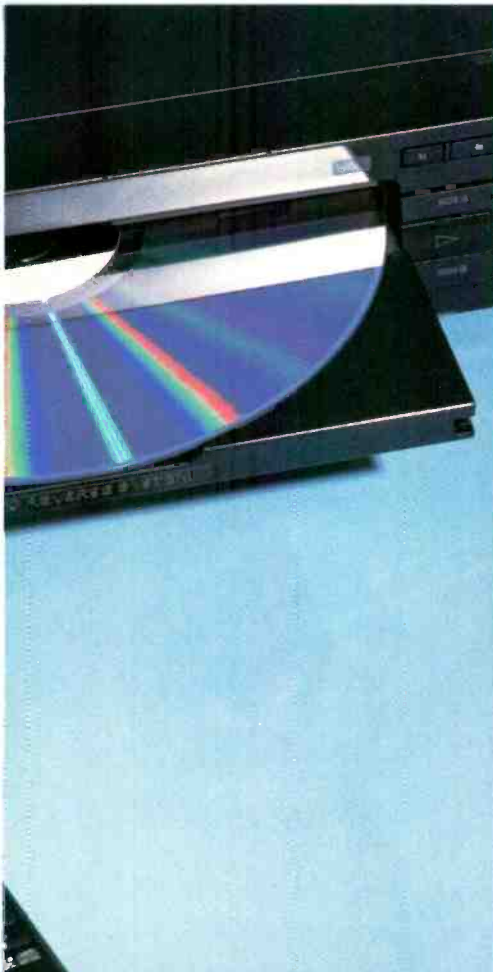
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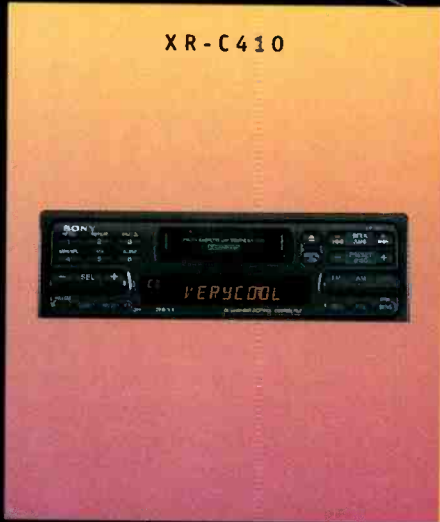
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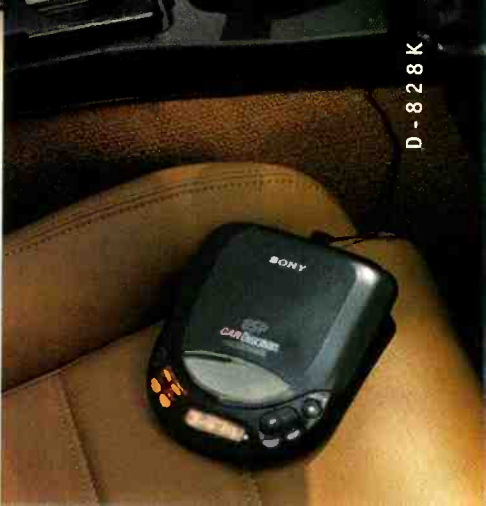
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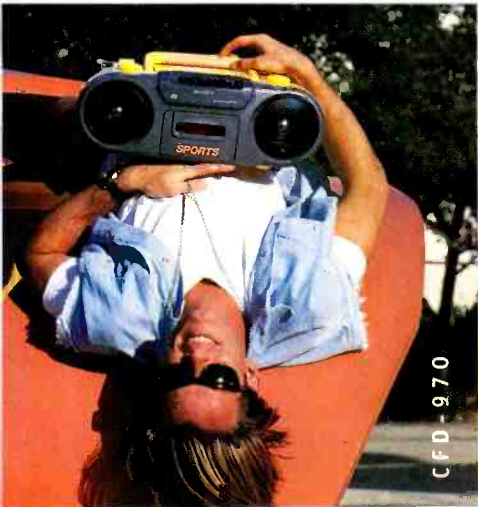


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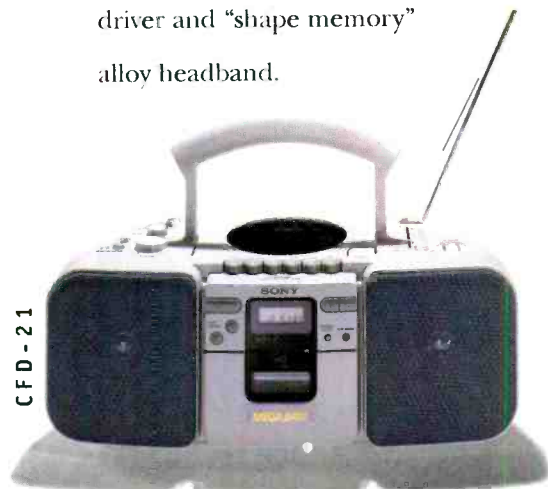
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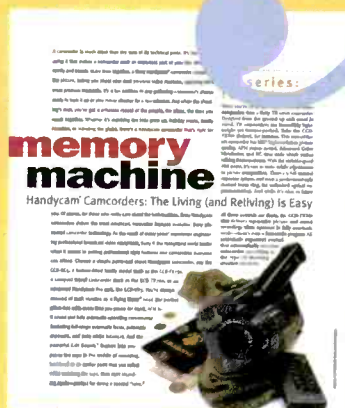
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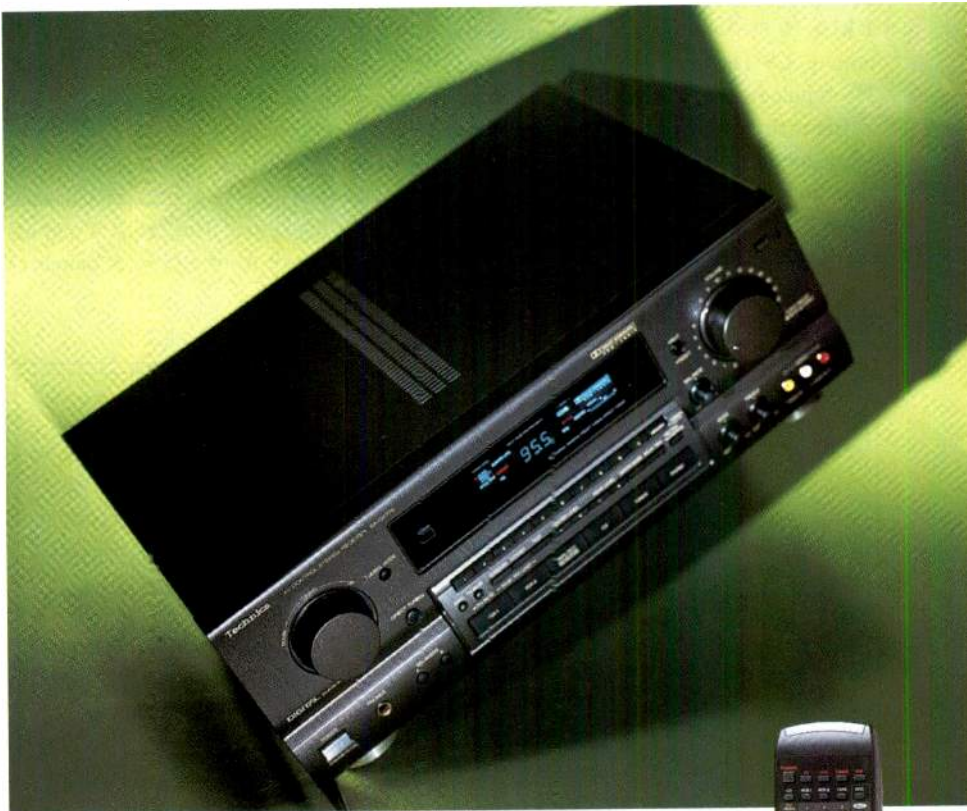
# TECHNICS SA-GX770 A/V RECEIVER

Anyone who thought that the soaring yen would price the Japanese out of the consumer electronics market has another think coming. When a company like Technics prices its top-of-the-line Dolby Pro Logic A/V receiver—the SA-GX770—at \$499.95 (THX systems go for more), it's clear that the Japanese have a way of coping with “endaka”—the rising yen of the 1990s—just as they cleared the “oil-shocku” hurdle in the 1970s.

With Japanese labor costs now exceeding those in the United States and much of Western Europe, the only way to build in Japan and stay competitive is to be vertically integrated and highly automated. Matsushita, Technics' parent company, fills the bill in both respects, as was quite apparent on a press trip I made to their Osaka factory last spring. Compared to what I saw on a visit two years prior, Matsushita has speeded its automatic insertion equipment dramatically and redesigned the guts of its receivers to minimize the number of wiring harnesses so that even final assembly is performed by machines.

Fundamental in Technics' drive for competitiveness, however, is the development of a new series of high-efficiency, two-channel, hybrid power modules that operate in what the company calls Class H+. As you're probably aware, several companies have adopted Class-H output topologies to improve efficiency in the region where audio output stages typically operate when handling music, that is, when they're delivering between 10% and 40% of rated output. Conventional Class-AB stages operate from fixed supply voltages and are most efficient when operating at maximum rating. At 10% of rated output, they're only about 20% efficient; at 40% of rated output, they're about 50% efficient and generate as much heat as useful power.

The idea behind Class H is to employ two sets of supply voltages (“rails”) and switch between them, depending on signal demands. When idling or delivering relatively low output levels, the low-voltage rails are used; as the signal level approaches the limits of the low-voltage supplies, the high-voltage rails take over. With adroitly chosen voltages, the improvement in efficiency can be dramatic, since the amplifier operates from the low-voltage source most



of the time and, to the extent that the amplifier delivers power close to the maximum possible with those supplies, uses each of the supply voltages in an efficient manner.

The problem with Class H comes in the transitions between supply rails. If the switchover is abrupt, distortion can be introduced; if it's slow, the system can't track high-frequency signals. Technics claims to have overcome these problems by using “variable amplifier bias” and “frequency dependent control”—the distinguishing features of Class H+. “Variable bias” anticipates what the signal is likely to do and adjusts for it. As the signal approaches the limit of the low-voltage supplies, the high-voltage pair is brought into action and turned on more fully as the signal reaches and exceeds the low-voltage limits, in the expectation that the signal level will continue to rise. “Frequency dependent control” keeps the rails at the higher voltage

for a short period of time after the signal drops so that, if high frequencies are present, each cycle is not handled independently; instead, the switchover tracks the signal “envelope.”

Technics has developed a series of hybrid power modules based on this concept. Each handles two channels and contains four output transistors (two per channel), a pair of Class H+ control transistors that govern the supply rails for both channels simultaneously, a protection IC, a driver IC, and assorted other components to make up two complete output stages. The hybrid modules are assembled and tested by automated equipment so that when they reach the final production line, they're sure to work.

The SA-GX770 uses two of the most potent Technics hybrids, and, as A/V receivers go, it certainly doesn't lack for power. In stereo, it carries an FTC rating of 125 watts



Photos: Michael Groen

per channel into 8-ohm loads (0.05% THD from 20 Hz to 20 kHz); in five-channel operation with 8-ohm loads all around, Technics claims 100 watts into each of the three front speakers and 100 watts shared between the rear pair. True, the output in the multichannel mode isn't specified in FTC parlance—distortion is specified only at 1 kHz (0.8%)—but that's not unusual among A/V receivers. Thanks to the Class H+ topology, the SA-GX770 is a lot more efficient than previous Technics receivers when handling music. Technics estimates that the SA-GX770 dissipates about 102 watts of heat in normal operation, compared with 197 watts for a previous model.

#### Control Layout

Based on features, functions, and price, it seems clear that the Technics SA-GX770 is targeted to those who want a basic, but adequately powered, home theater setup. It accommodates only two A/V sources ("VCR 1" and "VCR 2") and records on only one of those ("VCR 1"), which is limiting to dyed-in-the-wool home theater aficionados. The "VCR 2" inputs appear on both front and back panels (a

button above the front set selects which is active); the "VCR 1" inputs are in back. Video is handled in composite form, via RCA jacks; S-video connections are not provided. Inputs for a CD player, one audio tape deck, and an MM phono cartridge are available, but don't look for fancy gold-plated connectors on this unit.

On the output side of the equation are jacks for recording on the audio deck and "VCR 1," a video output for a monitor, left and right subwoofer line outputs, and terminals for two pairs of front speakers, a center speaker, and a rear pair. The center-speaker connectors are spring-loaded; the others have manual clamps. Completing the rear panel are a detachable line cord, two switched outlets rated at 80 watts, screw terminals for turntable ground and for 75-ohm FM and single-wire AM antennas, a special jack for the AM loop (included), and a remote-control jack to tie into other Technics equipment. A reasonably quiet cooling fan activates as needed.

Except for an unusually large "Tuning" knob, the control panel is conventional. The "Power" switch is at the lower left, followed by a "Phones" jack, "Speaker A/B" buttons, and source-selector pads ("VCR 1," "VCR 2," "Tape/DCC Monitor," "CD," "Tuner," and "Phono"). At the lower right are "Bass" and "Treble" knobs and the secondary "VCR 2" inputs; above them are a motorized "Volume" control, a small "Balance" knob, and a "Help/Reset" button—one of the SA-GX770's really neat features.

How many times has a system seemed to have died when all that's happened is that someone accidentally pressed the tape monitor? If this occurs with the SA-GX770, a tap on "Help" displays a message of what you should do to correct the problem. The receiver monitors itself for common mistakes. For example, if neither front speaker is on when you power up the unit, "Speakers Off" scrolls across the display. Not all problems are handled so easily, but neophytes (and even old-timers) should react positively to this "Help" feature.

Mirroring the "Volume," "Help," and "Balance" controls on the right are those

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THAN ENTRY-LEVEL  
PERFORMANCE AT AN  
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## SPECS

#### AMP SECTION

**FTC Power Rating, Stereo Mode:** 125 watts/channel at 0.05% THD, 20 Hz to 20 kHz, both channels driven, 8-ohm loads.

**Power Rating, Five-Channel Mode, for 0.8% THD at 1 kHz, 8-Ohm Loads:** Front, 100 watts x 2; center, 100 watts; rear, 100 watts.

**Low-Frequency Damping Factor:** 30 (8 ohms).

**Dynamic Headroom:** 2 dB (8 ohms).

**SMPTE IM:** 0.3% (8 ohms).

**Frequency Response:** Phono, RIAA standard curve,  $\pm 0.8$  dB; line, 7 Hz to 70 kHz,  $\pm 3$  dB.

**Input Sensitivity/Impedance (IHF):** Phono, 0.4 mV/47 kilohms; line, 27 mV/22 kilohms.

**S/N, A-Weighted (IHF, re: 1 Watt):** Phono, 70 dB; line, 75 dB.

**Tone-Control Range:** Bass,  $\pm 10$  dB at 50 Hz; treble,  $\pm 10$  dB at 20 kHz.

**Loudness Contour:** +9 dB at 50 Hz (volume at -30 dB).

#### FM TUNER SECTION

**Usable Sensitivity:** Mono, 11.2 dBf.

**50-dB Quieting Sensitivity:** Mono, 18.3 dBf; stereo, 38.3 dBf.

**Total Harmonic Distortion:** Mono, 0.2%; stereo, 0.3%.

**Signal-to Noise-Ratio:** Mono, 75 dB; stereo, 70 dB.

**Frequency Response:** 20 Hz to 15 kHz, +1, -2 dB.

**Capture Ratio:** 1 dB.

**Alternate-Channel Selectivity:** 65 dB.

**I.f. Rejection:** 80 dB.

**AM Rejection:** 50 dB.

**Image Rejection:** 45 dB.

**Spurious-Response Rejection:** 75 dB.

**Channel Separation:** 40 dB at 1 kHz, 30 dB at 10 kHz.

**Carrier Leakage:** -35 dB at 19 kHz, -50 dB at 38 kHz.

#### AM TUNER SECTION

**Sensitivity, External Antenna:** 20  $\mu$ V, 330  $\mu$ V/m.

**Alternate-Channel Selectivity:** 55 dB.

**Image Rejection:** 40 dB.

**I.f. Rejection:** 60 dB.

#### VIDEO SECTION

**Output Voltage:** 1.0 V,  $\pm 0.1$  V, peak to peak.

**Maximum Input Voltage:** 1.5 V, peak to peak.

#### GENERAL SPECIFICATIONS

**Power Consumption:** 300 watts (385 VA).

**Power Supply:** 120 V a.c., 60 Hz.

**Dimensions:** 17 in. W x 6 $\frac{1}{4}$  in. H x 13 $\frac{3}{8}$  in. D (43 cm x 15.8 cm x 35.2 cm).

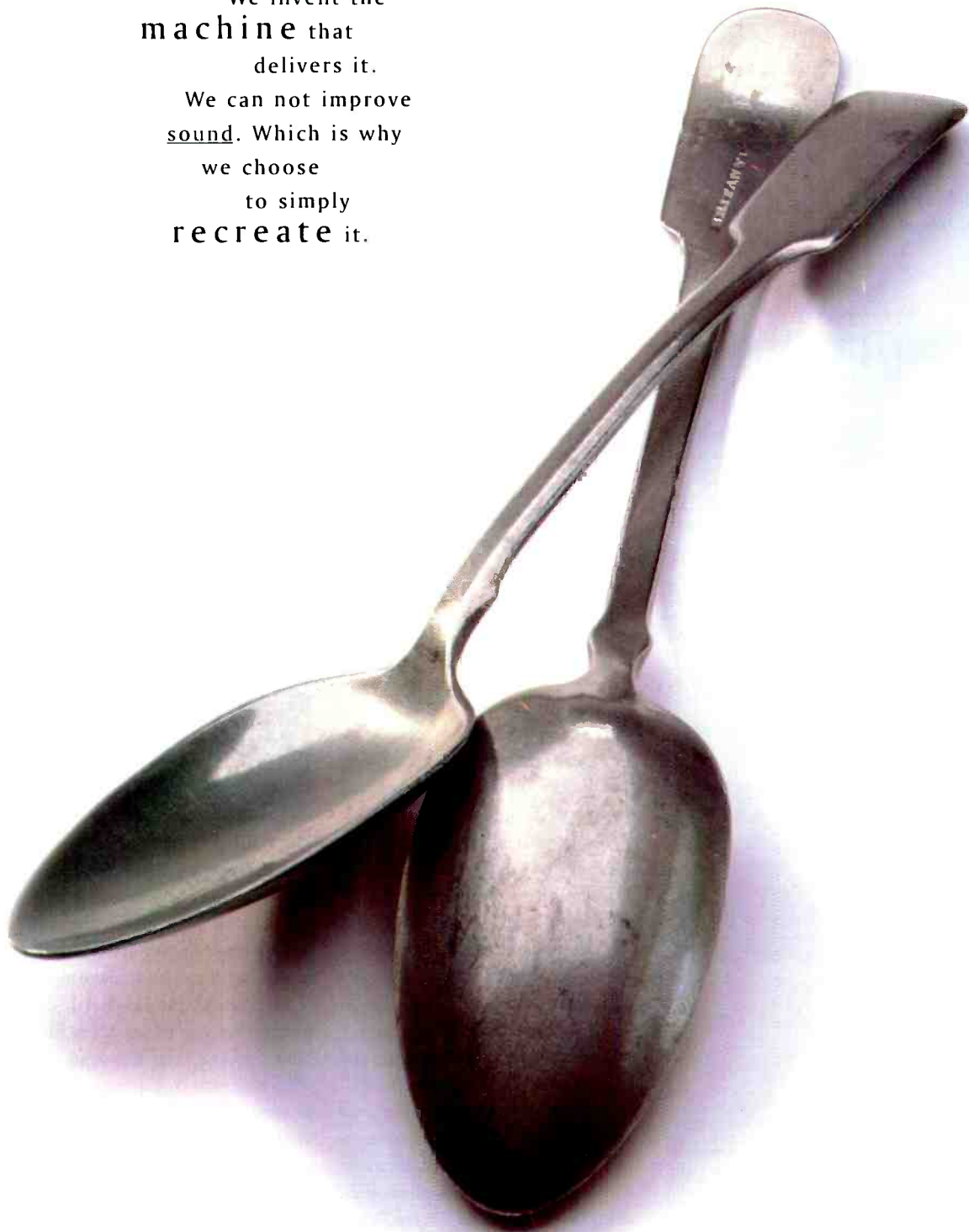
**Weight:** 22.2 lbs. (10.1 kg).

**Price:** \$499.95.

**Company Address:** One Panasonic Way, Secaucus, N.J. 07094.

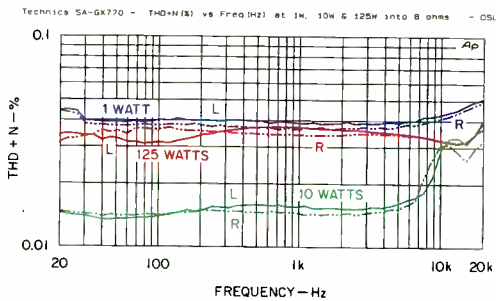
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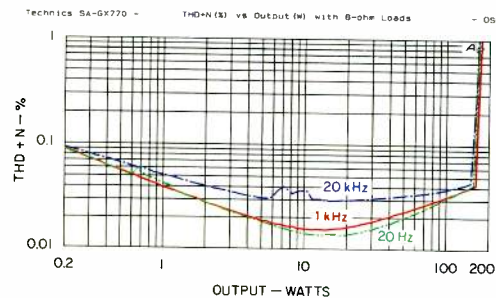


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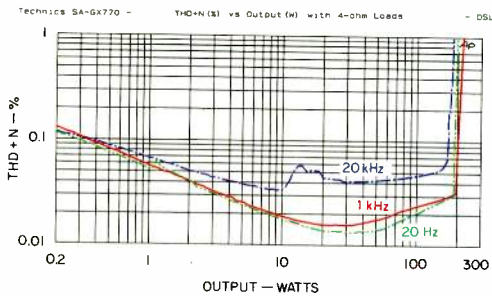
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**Fig. 1—Amplifier section THD + N vs. frequency.**

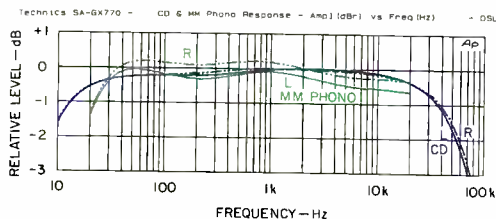


**A**



**B**

**Fig. 2—THD + N vs. output for loads of 8 ohms (A) and 4 ohms (B).**



**Fig. 3—Frequency response for phono and CD inputs.**

for “Tuning,” “Tuning Mode,” and “Direct Tuning” on the left. “Tuning Mode” cycles through three possibilities: “Auto,” which seeks the next available station; “Manual,” which permits you to tune stations with the “Tuning” knob, and “Lock,” which locks in the current station. “Direct Tuning” permits you to enter a specific station frequency with the 10 numeric pads under the main display. These also serve to recall any of the 30 station presets. You can load presets manually or automatically. In the latter case, the first 20 slots are assigned to the FM band and the last 10 to the AM band. Auto presetting is activated by pressing the “Memory” key at the far right of the numeric pads; manual presetting is accomplished by tuning to the desired station and then pressing “Memory” and selecting the desired preset number.

The remaining controls are sandwiched between the numeric pads and the source selectors. On the far left, “Band” chooses the reception band, and “FM Mode” toggles between stereo and mono reception. On the far right is a “Muting/Loudness” key. A momentary press mutes or unmutes the receiver; pressed and held, the loudness toggles on and off. In the middle are the surround controls. The first pair from the left, “Surround” and “3 Stereo,” activate the Dolby Pro Logic decoder in either full Dolby Pro Logic surround or in a three-channel mode that doesn’t use rear speakers. A second tap toggles the system off. “Test,” “Center Level,” and “Rear Level” pads come next and are used to balance the system. “Center Mode” cycles between normal-, wide-, and phantom-center operation, and “Delay Time” adjusts rear-channel delay in 5-mS increments from 15 to 30 mS.

The SA-GX770 comes with a 56-key remote control that is compatible with Technics products manufactured since 1985. The remote is preprogrammed with the control

codes needed to operate equipment from many other manufacturers.

### Measurements

Technics’ new hybrid power modules do a nice job. Although the SA-GX770 is rated at “only” 125 watts (21.0 dBW) per channel (8-ohm loads), I measured a clipping point of 170 watts (22.3 dBW) per channel with those loads and 215 watts (23.3 dBW) per channel when terminating with 4 ohms. As shown in Fig. 1, THD + N is safely under Technics’ 0.05% spec at rated power across the band. Only the 10-watt curves show an increase in distortion above 7 kHz that can be attributed to Class-H operation. However, as you can see, distortion just touches 0.04% at 20 kHz, so I consider it negligible. At full power, the anomaly disappears, presumably due to the “frequency dependent control” circuit.

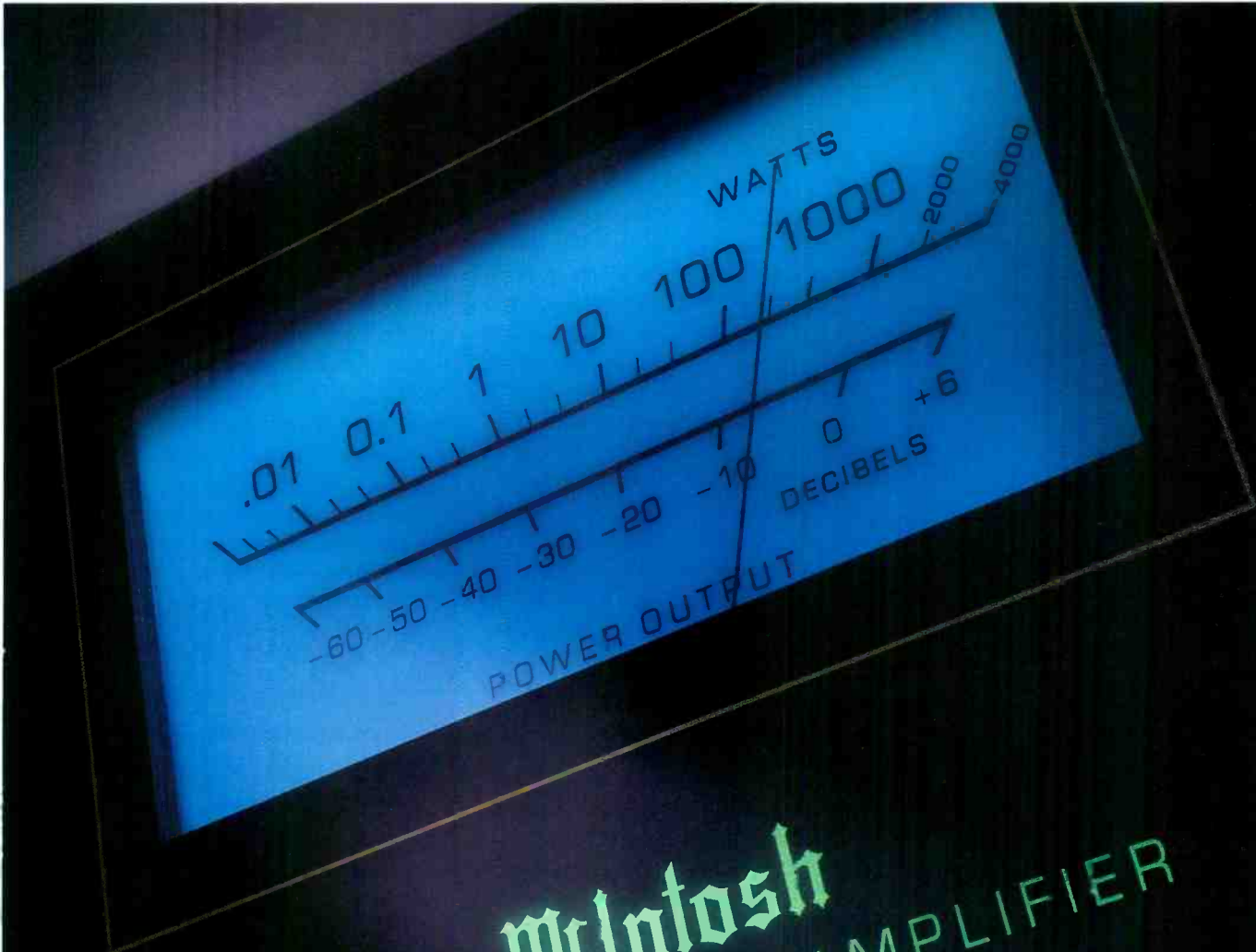
Figure 2 displays THD + N as a function of power at three test frequencies. Figure 2A shows the results with 8-ohm loads,

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Fig. 2B with 4-ohm termination. The 20-kHz curves show a hint of Class-H switching distortion in the region of 6 to 12 watts with 8-ohm loads and in the region of 10 to 20 watts with 4-ohm loads, but it’s just a hint. Class H can be much worse than this.

The hybrid modules also do well on bursts. Dynamic power, using the IHF tone burst, clocked in at 230 watts per channel with 8-ohm terminations, for a dynamic headroom of 2.6 dB—well above spec. With 4-ohm loads, I measured 315 watts per channel from this “125-watt” receiver. Damping factor (140) was much better than Technics’ claim, and output impedance stayed relatively low across the audio band (rising from 55 milliohms at 1 kHz, to 75 milliohms at 5 kHz, 120 milliohms at 10 kHz, and 180 milliohms at 20 kHz).

The SA-GX770 proved more sensitive than spec. From the high-level inputs, it delivered 1 watt from an 18.3-mV source



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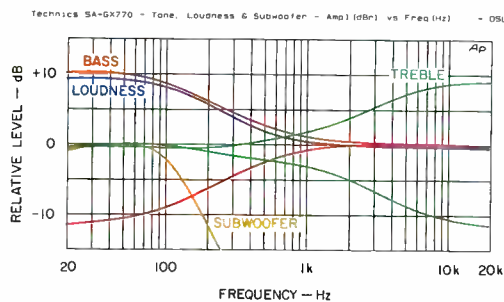
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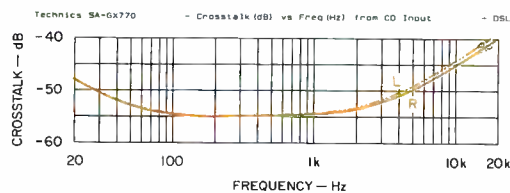
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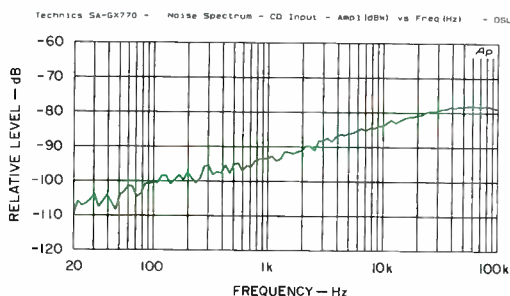
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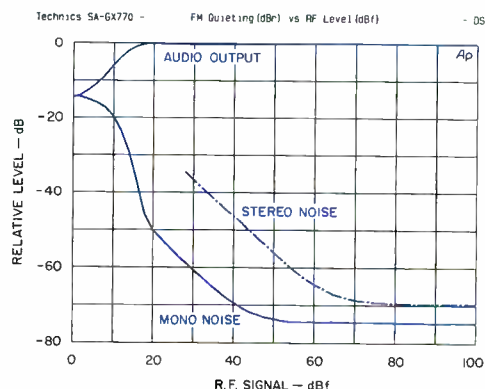
**Fig. 4—Action of tone controls, loudness compensation, and subwoofer filter.**



**Fig. 5—Crosstalk**



**Fig. 6—Noise spectrum, CD input.**



**Fig. 7—FM quieting characteristics.**

and needed only 0.32 mV (1 kHz) for equivalent output from the MM phono input. Sensitivities for rated output calculate to be 205 and 3.6 mV, respectively.

As shown in Fig. 3, frequency response is quite flat for an amplifier without a tone-defeat switch: +0, -0.5 dB from 20 Hz to 25 kHz (-3 dB at 70 kHz) from the CD input and +0, -0.6 dB from 25 Hz to 20 kHz from the phono.

Input impedances (34 kilohms for CD, 44 kilohms in parallel with 130 pF for MM phono) seemed fine. With standard volume setting, channel balance was perfect from the CD input. The A-weighted noise, although setting no new standard, was -76.2 dBW (CD input) and -71.5 dBW (MM phono), safely above Technics' claims. When referenced to rated power, A-weighted S/N ratios become 97.2 and 92.5 dB, respectively.

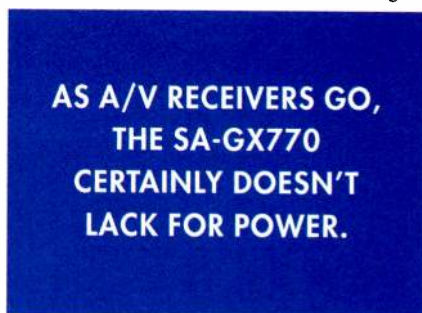
Figure 4 depicts the tone-control range, the loudness contour, and the response of the internal subwoofer crossover. At 50 Hz, the bass provides a range of +10, -10.6 dB; at 10 kHz, the treble can boost 8.7 dB and cut 10.5 dB. Engaging the loudness circuit produces a 9.3-dB boost at 50 Hz. Subwoofer crossover occurs at 110 Hz (-3 dB), with a slope of 12 dB per octave.

Levels at the recording terminals measured 0.27 V from the MM phono input (5 mV at 1 kHz) and 0.51 V when using the FM tuner (100% modulation). From high-level inputs, the gain was close to unity: 0.475 V out for 0.5 V in. Output impedance at the recording jacks was a bit high, 3.6 kilohms. Keep the cable length reasonably short.

Crosstalk from the CD inputs is better than -50 dB from 30 Hz to 4.5 kHz and -45 dB out to 10 kHz (see Fig. 5). A third-octave spectrum analysis from that input (Fig. 6) is remarkably free of hum components.

The SA-GX770's only weakness as far as amplifier performance is concerned lies with the rather low input-overload margins. Input clipping occurred with a 62-mV (1-kHz) signal at the MM phono terminals and with a 3.6-V CD input. Although the numbers are below those I'd like to see, I don't expect you will encounter any problems in most listening situations. Most CD players output a maximum of 2 V, and I expect that only very high-output cartridges are likely to deliver more than 62 mV from a record.

As far as sensitivity goes, the FM tuner in my sample proved disappointing, so I obtained a second unit and made all FM measurements on it. As shown in Fig. 7,



50-dB quieting with mono modulation is attained with a 19.9-dBf input; equivalent quieting in stereo is reached at the 44.0-dBf level. The tuner comes within a whisker of meeting its rated mono S/N ratio (74.6 dB versus the 75-dB spec). In stereo, I measured an S/N of 67.0 dB at the 65-dBf reference level, but, with a stronger input applied, the S/N continues to improve and tops out at just a shade under the 70-dB spec.

In Fig. 8, tuner THD + N versus frequency, there is virtually no difference between the mono and stereo curves out to 600 Hz; distortion on both averages just under 0.5%. Above 600 Hz, stereo distortion rises (typical) and mono distortion decreases (atypical). At the 6-kHz benchmark, THD + N is 2.12% in stereo and 0.21% in mono.

Figure 9 shows AM and FM frequency response and FM separation. The FM response is excellent—+0.0, -0.6 dB from 26 Hz to 15 kHz—and separation is 30 dB or better from 130 Hz up. The AM response is typical: +0.2, -6 dB from 95 Hz to about 3 kHz.

Capture ratio measured a decent 1.4 dB at 45 dBf, and the tuner exhibited very



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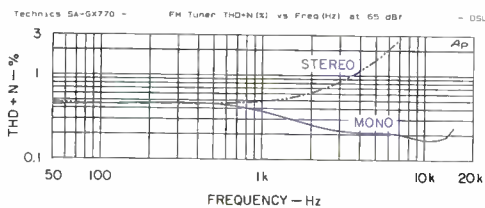
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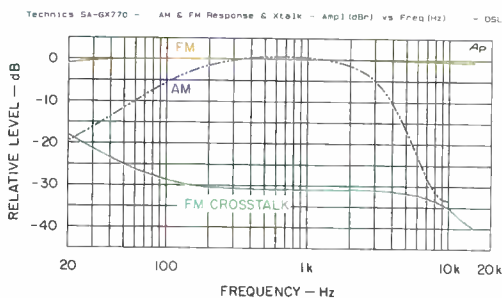
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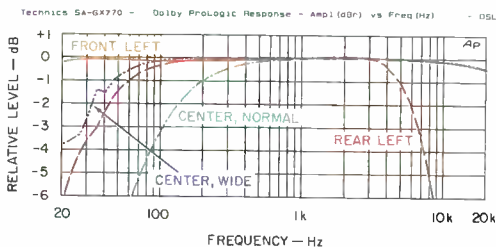
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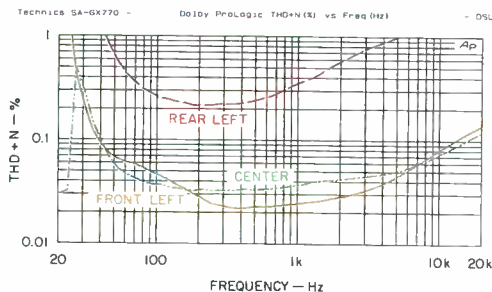
**Fig. 8—THD + N vs. frequency, FM tuner section.**



**Fig. 9—FM and AM frequency response and FM-stereo crosstalk.**



**Fig. 10—Frequency responses, Dolby Pro Logic mode.**



**Fig. 11—THD + N vs. frequency, Dolby Pro Logic mode.**



good selectivity: 8.1 dB from the adjacent channel, 70.5 dB from the alternate channel. Image rejection was 51.7 dB, and AM rejection was 52.9 dB—both better than spec. The 19-kHz pilot was suppressed by 36.3 dB (the 38-kHz subcarrier by 61.9 dB) at the tape recording output.

With Dolby Pro Logic decoding, response is very good at all outputs. As shown in Fig. 10, front-channel response is essentially identical to that in stereo mode, while center-channel response (center-wide mode) is within +0, -0.5 dB from 62 Hz to 20 kHz (-3 dB at 28 Hz). In the center-normal mode, the low end is down 3 dB at 100 Hz, which is Dolby Labs' recommendation. Rear-channel response is down 3 dB at 6.6 kHz (again in accordance with Dolby Standards) and at 35 Hz on the low end.

With 8-ohm loads and Dolby Pro Logic decoding, the front channels delivered 115 watts (20.6 dBW) a side at clipping; the center delivered 120 watts (20.8 dBW). Rear-channel clipping occurred at 60 watts a side (17.8 dBW); this makes sense, since the same output circuit drives both channels and is delivering 120 watts into the pair. The A-weighted noise measured -73.7 dBW in front, -74.0 dBW in the center, and -69.9 dBW in the rear. This yields signal-to-noise ratios (referenced to the clipping points) of 94.3, 94.8, and 87.7 dB, respectively.

Figure 11 is a plot of THD + N versus frequency at rated output with Pro Logic decoding. (The rear channels were measured at 50 watts each.) As Pro Logic systems go, the results are excellent—especially in the three front channels, which produced less than 0.1% THD from 38 Hz to 12 kHz. It's normal for the rear-channel distortion to be greater than that in front, and the results I obtained on the SA-GX770 are fine in my book.

Pro Logic channel separation was adequate, close to or better than 30 dB between opposing channels. Separation between the left front

and the rear was best (64.6 dB); separation between the right front and the center was worst (29.8 dB). On average, separation was on the order of 40 dB.

#### Use and Listening Tests

The Technics SA-GX770 is somewhat of an enigma. It's easy to use, the ergonomics are good, and the "Help" feature may avoid unnecessary calls to the repair shop or reduce time spent looking for "obvious" problems. It sounds fine—I'd even say great, considering the price—and the Pro Logic operation is certainly adequate. I don't know where else you can get this much power for the money—or power that's so sensibly distributed among the channels.

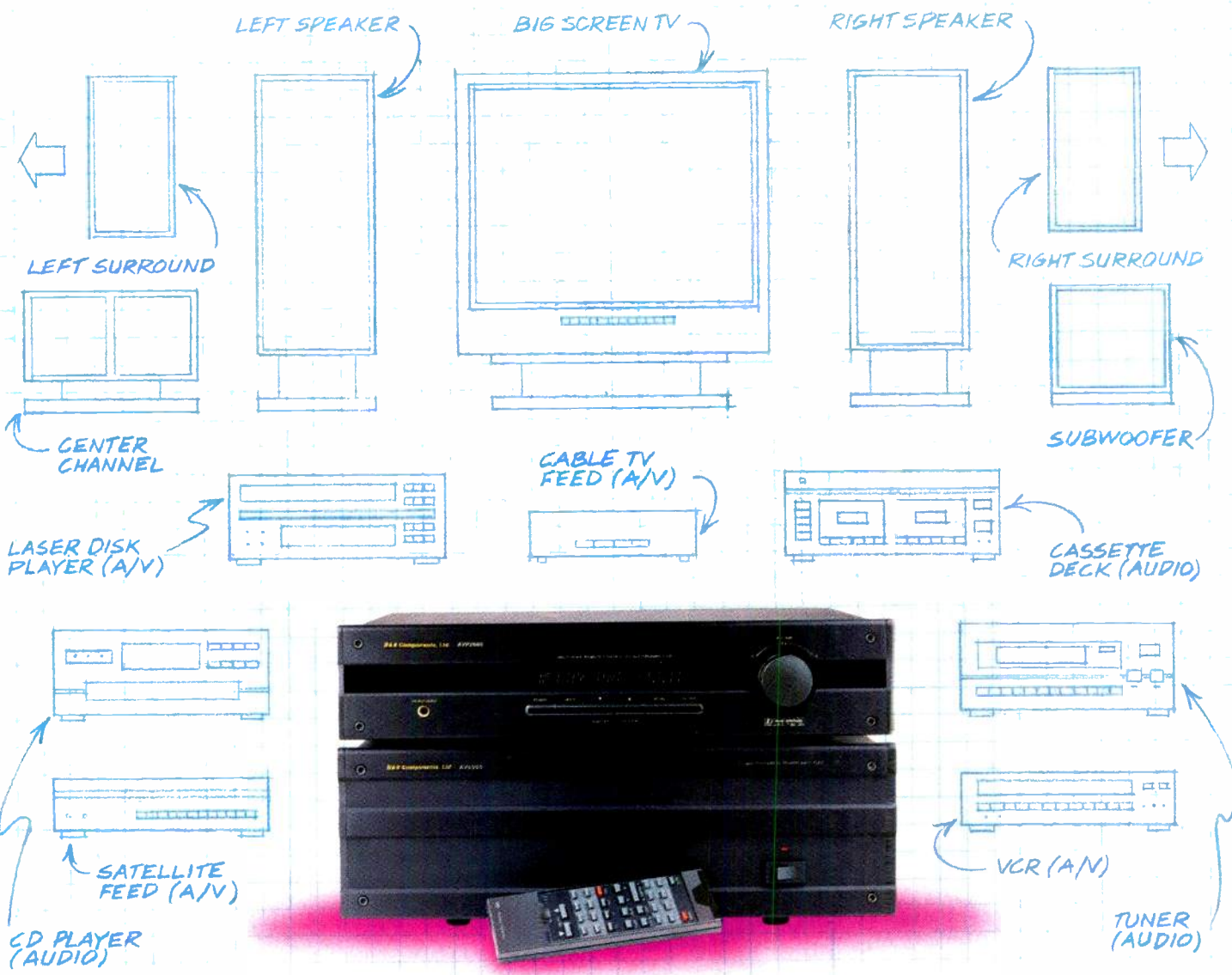
Setting aside the relatively low input-clipping points (which are unlikely to cause a problem under average conditions), the major fly in the ointment (as I see it) is the

**I DON'T KNOW WHERE  
YOU CAN GET THIS MUCH  
POWER, SO SENSIBLY  
DISTRIBUTED,  
FOR THE MONEY.**

paucity of A/V inputs. In my book, two ain't enough. Not for anyone seriously interested in home theater.

Anyone who wants to use the SA-GX770 for both music and home theater is likely to come up short. If you tie up the two line-level audio inputs with a CD player and tape deck, how do you feed a stereo TV broadcast to the decoder? If you use "VCR 2" to feed stereo from your TV into the receiver, you're down to one VCR or a videodisc player, but not both. To use two VCRs or a VCR and a disc player, you'll have to use the TV tuner in one of the VCRs for reception. That may be adequate for an entry-level product, and entry-level buyers should probably give this receiver serious consideration. It delivers far more than entry-level power and (by and large) far better than entry-level performance at an entry-level price. I guess I'm just chagrined that with so much to offer, the SA-GX770 could be far more than an entry-level product—if only it had a few more inputs!

*Edward J. Foster*



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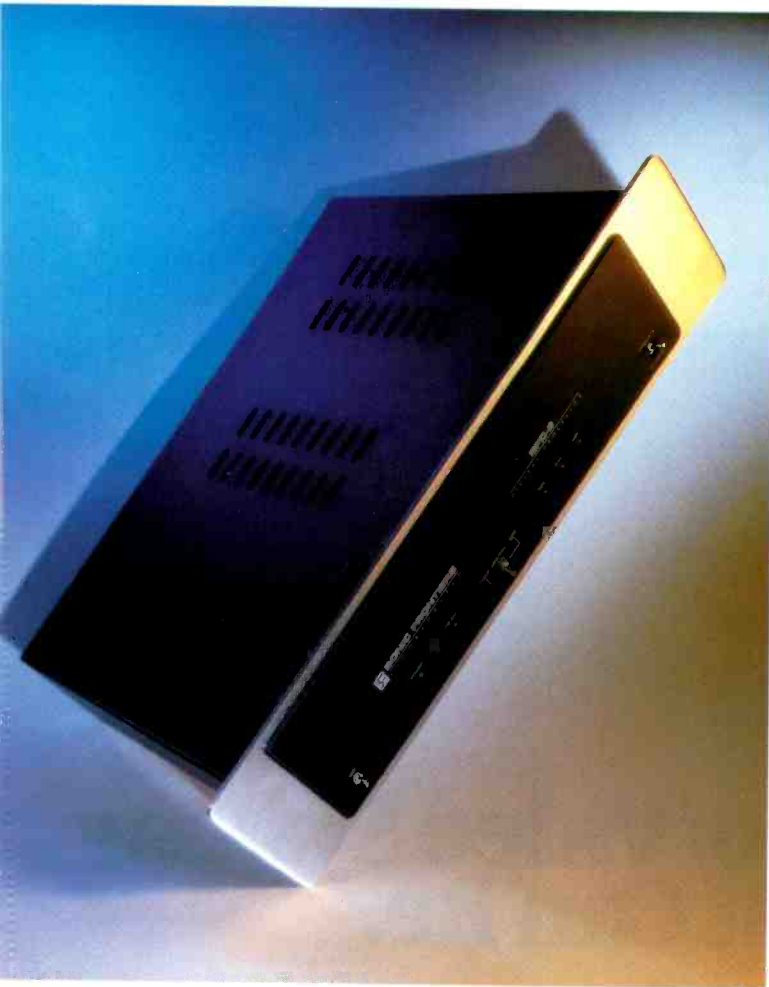
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# SONIC FRONTIERS SFD-2 D/A CONVERTER



best. Among its circuit features are a digital filter with eight-times over-sampling, dual UltraAnalog converters in a balanced configuration, and a fully balanced tube output stage.

Starting out with a heavy-gauge steel enclosure and stainless steel front panel, the approximately 30-pound package is beautiful, rugged, and functional. Three front-panel toggle switches, spaced across the front panel, set output polarity, select input source, and select "Standby" or "Operate" mode. Three LED indicators in the left half of the panel show "Power," signal

**T**he first time I heard the Sonic Frontiers SFD-2 D/A converter, I said to myself, "Got to get one of those machines to try out and, I hope, to review." Sonic Frontiers was kind enough to let me try one out, and after I listened to and enjoyed the unit for a number of months, the gods finally aligned the universe in such a manner as to allow me to review it.

I think the SFD-2's price/performance ratio makes it a breakthrough product. With some input from UltraAnalog Inc., Sonic Frontiers has designed a D/A converter that is right up there among the very

lock-in, and de-emphasis. Toward the right, three more LEDs show the sampling frequency of the selected input's signal. Digital inputs on the rear panel include an XLR jack for AES/EBU signals, a phono connector for coax, and an AT&T (ST) glass-fiber connector. Conspicuous by its absence is the Toslink optical connector that many audiophiles consider sonically inferior. A coaxial output (another phono jack) carries the se-

lected digital input for connection to other equipment. Neutrik silver XLRs are used for balanced analog outputs; Kimber Kable phono connectors are used for the unbalanced outputs as well as for the digital input and output phono connectors. An IEC a.c. power connector and line-fuse holder round out the rear-panel features.

The interior space is divided roughly into thirds. The left-hand section, as seen from the rear, houses the power-supply p.c. board, which feeds the digital processor board and provides plate and heater power for the analog output board. An example of the many nice touches in the SFD-2 is the use of power transformers with end bells instead of the usual open-construction board-mount transformers. In the middle section is the digital processor board, surrounded by a metal shield to keep the digits contained therein. Analog circuitry (consisting of output-stage voltage regulators, a passive output-filter assembly, muting relays, and the tube output stage) is on the third p.c. board to the right. The fourth p.c. board, mounted behind the front panel, interconnects the LEDs and digital input selector, and provides the power on/off time-delay and muting-control circuitry. High-quality parts, such as Caddock and Holco resistors and MIT film capacitors, abound. Build quality is superb. Truly, this is a first-rate component!

The SFD-2 is one of the first products, if not the first, to use the new UltraAnalog AES 20 input-receiver module. Convinced that jitter in the incoming S/P DIF data stream and the jitter produced in the input receiver itself are potential causes of audible degradation in the final audio output of a D/A converter, UltraAnalog set about designing an input receiver that would reduce

**THE SFD-2'S RATIO OF  
PRICE TO PERFORMANCE  
TRULY MAKES IT A  
BREAKTHROUGH PRODUCT.**

these effects. The AES 20 contains a low-jitter input-receiver chip and fast phase-locked loop (PLL) combined with a second PLL that reduces the overall jitter-attenuation cutoff frequency to about 1 kHz. Some unusual techniques are employed in the AES 20, including brass shielding of the phase-locked

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loops, to insure ultra-low jitter in the receiver module's outputs.

Digital outputs of the AES 20 module are fed to an NPC SM5803 digital oversampling low-pass filter. This in turn drives two UltraAnalog D20400A dual D/A converter modules in a complementary, or push-pull, signal arrangement, one for each channel. The digital data is fed, with normal and inverted polarity, into the two inputs of each channel's D/A module. Within each stereo channel, this tends to cancel any common even-order error characteristics in the difference between the two phases of each module's audio outputs. Richard Powers of UltraAnalog might contest this by countering that the D20400A measures so well, as normally used (one module used for both channels), that this differential operation using two modules may be needlessly gilding the lily. Perhaps so, but the proof of the pudding is in the listening, and in my own and others' opinions, the SFD-2 definitely sounds better when listening to the differential output, as opposed to using the single-ended output. (This is, perhaps, getting ahead of myself.)

## SPECS

**Sampling Rates:** 32, 44.1, and 48 kHz.

**Frequency Response:** 5 Hz to 20 kHz, +0.5, -0.1 dB.

**S/N, A-Weighted:** Greater than 110 dB.

**THD:** Less than 0.05%.

**Jitter:** Intrinsic jitter, less than 40 picoseconds; jitter rejection from 1 kHz up.

**Channel Separation:** At 1 kHz, greater than 105 dB; at 10 kHz, greater than 85 dB.

**Output Voltages:** Unbalanced, approximately 3.5 V; balanced, approximately 7.0 V.

**Dimensions:** 19 in. W x 4 in. H x 13 in. D (48.3 cm x 10.2 cm x 33 cm).

**Weight:** 26½ lbs. (12 kg).

**Price:** \$4,695.

**Company Address:** 2790 Brighton Rd., Oakville, Ont., Canada L6H 5T4.

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The audio outputs from the D/A converter modules are led out of the digital board via shielded cables to the input of the analog board. Here they are filtered in a proprietary passive low-pass circuit that combines inductors and capacitors with an adjustable twin-T notch filter, presumably to null out the eight-times oversampling frequency (352.8 kHz). Finally, a tube cathode follower, utilizing a Sovtek 6922 dual triode in each channel, buffers the passive filter outputs and provides a low-impedance final audio output. These cathode-follower circuits utilize positive and negative 120-V d.c. supplies in order to eliminate a cou-

pling capacitor between the DAC/filter output and the tube's control grid. Four separate solid-state voltage regulators supply the positive and negative voltages for each channel. Note, there are two followers for each channel, one for each signal phase. There is no provision for combining the two phases into one composite unbalanced output; rather, the unbalanced output is the output of the positive-polarity signal.

The three transformers on the power-supply p.c. board are, logically, assigned to powering the tube output circuitry, the digital +5 V loads, and separate positive and negative 16-V supplies for the UltraAnalog D20400As in each signal channel. Power for the tube heaters is sourced from a full-wave-rectified, unregulated d.c. supply. The front-panel "Standby/Operate" switch connects or disconnects the tube heaters from this supply. When the unit is plugged into the a.c. line, all the digital circuitry and high-voltage supplies to the tube output buffers are operational.

## Measurements

Frequency response for both channels, with instrument loading on the balanced outputs, is plotted in Fig. 1. Also shown is the effect on one channel's response of loading the output with the IHF load (10 kilohms in parallel with 1,000 pF). The main effect is a reduction of low-frequency response caused by the high-pass filter action between the 3.3- $\mu$ F output coupling capacitors and the effective load per phase of 5 kilohms (or 10 kilohms, phase to phase). Also seen is the wideband drop in output of the 10-kilohm load against the intrinsic output impedance of the tube cathode-follower stage, some 0.31 dB. High-frequency response is essentially unchanged by the IHF loading. Best low-frequency response (which has an effect on overall space, not just bass) will be obtained with balanced loads of 50 kilohms or more. Frequency response for the un-

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balanced outputs (not shown) was about the same as for the balanced outputs, except that the low-frequency loss with the IHF load was only about half as

great. Response with de-emphasis switched in was perfectly flat and therefore is not shown.

Total harmonic distortion plus noise, as a function of frequency at digital full-scale, is shown in Fig. 2 for balanced outputs with instrument loading. Distortion is low up to about 1 kHz, because of second-harmonic cancellation in the push-pull output. For some reason, the balance degrades above about 1 kHz, so the overall distortion rises as shown. Results are shown for two measurement-filter bandwidths, 22 and 80 kHz. The increased high-frequency distortion measured in the 80-kHz bandwidth is partially due to harmonic distortion itself, but it also includes some leakage of the eight-times oversampling frequency into the measurement.

Putting the IHF load on the balanced outputs is kind of rough on these tube cathode-follower output stages. We have already seen that it unacceptably (in my opinion) affects low-frequency response.

*“...the best A/V receiver  
I have ever tested.”*

—David Ranada, *STEREO REVIEW*



## THE ONKYO TX-SV919THX

In the August 1994 issue of Stereo Review, Technical Editor David Ranada had this to say about the Onkyo TX-SV919THX:

**“Powerful, accurate, and clean with music, and especially when decoding soundtracks, Onkyo's standard-setting TX-SV919THX is the best A/V receiver I have ever tested.”**

High praise indeed from a man who's probably heard just about every A/V receiver made to date. And it affirms what we at Onkyo already knew—that the world's first Home THX® receiver had to be the world's finest Home Theater receiver.

As part of its unparalleled performance package, the TX-SV919THX offers digital Dolby Pro Logic decoding, digital Home THX Cinema processing, eight digital soundfield modes, discrete output stages for all channels (100 watts to the three front channels, 50 to each of the surrounds), multi-colored on-screen display, plus 10 audio/6 video inputs. And the TX-SV919THX is as ready for tomorrow as it is for today, with full Dolby Surround Digital capability.

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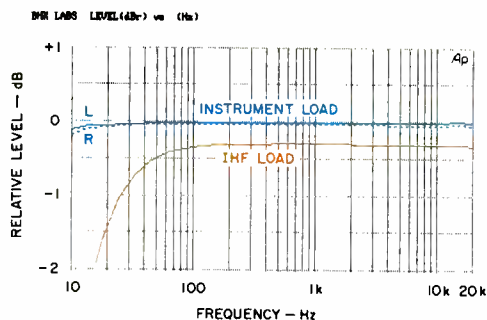


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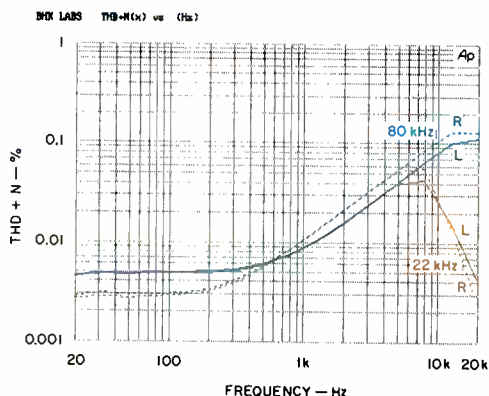
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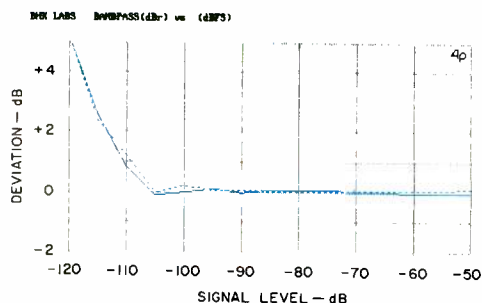
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**Fig. 1—Frequency response.**



**Fig. 2—THD + N vs. frequency for 0-dB digital signals.**



**Fig. 3—Deviation from linearity.**

In the case of full-scale harmonic distortion, the IHF load (not shown) raised the amount of distortion to about 0.03% or 0.04% up to 2 or 3 kHz, with the curve then blending into the levels seen in Fig. 2. Not a bad result, really. With the unbalanced outputs, THD + N was approximately twice as much as shown in Fig. 2. Looking at the distortion in the DAC output before the filter and tube stage, I could see that the tube output stage was the dominant cause of the output distortion.

Measurements of distortion versus digital signal level (not shown) indicated that distortion decreases rapidly with decreasing signal level and is down in the noise by about -12 dB full-scale (dBfs). However, in reality, the higher numbers discussed above for full-scale signals are not the distortion levels that the system produces with music, as the average level of most digital program material is much lower than full-scale.

Deviation from linearity as a function of digital signal level is plotted in Fig. 3 for 500 Hz. The data shown is for the unbalanced outputs, but there was no noticeable difference with the balanced outputs. Using the CBS CD-1 fade-to-dither test (which measures the same kind of thing but uses a CD transport to drive the D/A instead of the Audio Precision digital generator) yielded essentially the same result.

I was curious to see if using a balanced AES/EBU feed from my digital signal source instead of my usual unbalanced coax feed would make any noticeable difference in the measurements discussed thus far. Repeating some of the measurements with a balanced cable from the Audio Precision digital generator output to the AES/EBU input of the SFD-2 yielded essentially the same results.

Another look at low-level linearity is the noise-modulation test devised by Richard Cabot of Audio Precision. This test causes a low-level 40-Hz signal to be presented at input levels of -60, -70, -80, -90, and -100 dBfs. For each of these input levels, the output is analyzed by sweeping a third-octave filter from 300 Hz to 20 kHz. If things are in order, these five curves basically overlaid each other; this was the case for the SFD-2.

Interchannel crosstalk generally increased at a rate of 6 dB per octave after it rose above the noise level, which occurred at about 500 Hz to 1 kHz. Crosstalk for both directions, with balanced or unbalanced outputs, was better than 100 dB

down at frequencies up to 2 or 3 kHz and rose to a worst-case amount of about -75 dB at 20 kHz.

Test results for S/N, quantization noise, and dynamic range are shown in Table I for the balanced outputs. Data was similar for the unbalanced outputs, except the digital-zero (0-dBfs) noise levels were 2 to 3 dB noisier. Either output was quiet enough to easily resolve the three-state waveshape of an undithered -90 dBfs input signal.

Output resistance measured about 175 ohms for the unbalanced outputs and about 350 ohms for the balanced outputs. The a.c. line draw was 280 mA in "Standby" and 440 mA when the SFD-2 was warmed up and fully operating.

### Use and Listening Tests

Phono sources in my system during the review period included an Oracle Audio turntable fitted with a Well Tempered Lab arm and JVC X-1 moving-magnet pickup (used with my own tube phono preamp or a Quicksilver Audio preamp). Counterpoint DA-11A or PS Audio Lambda CD transports were used to feed the Sonic Frontiers SFD-2, the Stax DAC-Talent BD, and other (experimental) D/A converters. Other signal sources included Nakamichi's ST-7 FM tuner and 250 cassette recorder, and a Technics open-reel recorder. Preamplifiers used included a Quicksilver Audio, Forsell tube line drivers, and an AR Limited Model 2. Power amplifiers used were a Crown Macro Reference, Quicksilver M-135s, and an Arnoux MB300A digital switching design. Loudspeakers used were B & W 801 Matrix Series 3s augmented in the range from 20 to 50 Hz by a pair of subwoofer systems, each using a JBL 1400Nd driver in a 5-cubic-foot ported enclosure.

To get the full benefit of the differential (or push-pull) operation of the SFD-2, one needs to feed its differential output into a component (normally a line-level preamp) with a balanced input having an impedance of at least 20 to 30 kilohms, and preferably 50 kilohms or higher. The input-impedance consideration is relevant to getting the best low-frequency response, in view of the 3- $\mu$ F output coupling capacitors in the output of the SFD-2. If the contemplated system preamp is to feed an unbalanced output to a power amp, it is



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**Table I**—Signal-to-noise ratios. Quantization noise was  $-94.7$  dB in either channel; dynamic range was 96.1 dB in the left channel and 96.0 dB in the right.

Bandwidth	S/N, dB			
	-120 dBfs Signal		Digital Zero Signal	
	LEFT	RIGHT	LEFT	RIGHT
Wideband	93.1	93.1	108.7	108.2
22 Hz to 22 kHz	93.4	93.5	113.4	111.6
400 Hz to 22 kHz	93.6	93.6	115.9	115.7
A-Weighted	95.6	95.6	117.9	117.8

essential that this preamp combine both input phases, in a differential-amplifier manner, into the single output phase to be used. Some balanced-input preamps do not do this but separately pass both input phases on to the two output phases and include only *one* of these phases in their unbalanced outputs. Such a preamp will get best results from the SFD-2 if—and only if—the following power amplifier has balanced inputs.

I was impressed with the sound I got from the SFD-2 right from the start, using its unbalanced outputs to feed the unbalanced inputs of my Forssell line driver, which, in turn, drove my various power

amplifiers. I also modified the Forssell to accept a balanced source, combine both phases, have control of the volume, and then drive the amps unbalanced. The result was extremely good sound. This line driver permitted the SFD-2 to sound its best and has formed the basis for long-term listening with it.

The sound is characterized by a great sense of space and dimension, killer bass, great transparency and delicacy with low irritation levels, and simply the best digital sound reproduction I've had so far. Toward the end of the review period, I began using another, newer, Forssell line driver that is fully balanced from input to output and combines both input phases to either output phase; the sound became better yet. Using it to drive the Crown Macro Reference in balanced mode produced an exceptionally wonderful and musical sound.

amplifiers. I also modified the Forssell to accept a balanced source, combine both phases, have control of the volume, and then drive the amps unbalanced. The result was extremely good sound. This line driver

One thing that drove me nuts, until I found out what caused it, was that after I used the SFD-2 for a number of months, the sound became a bit edgy and irritating (sort of like a phono cartridge going bad). I tried changing everything, but nothing really helped until I changed the tubes in the SFD-2 and that wonderful sound came back! I personally think (but cannot conclusively prove) that the way the "Stand-by/Operate" switch works in the SFD-2 makes the tubes slowly deteriorate, with resultant sonic degradation. So I would simply advise owners of this otherwise outstanding piece of gear to either leave it on in the "Operate" mode and/or have some spare new tubes on hand to put in whenever the sound degrades (if, indeed, it does so for anybody else). Other than this, the SFD-2 operated flawlessly.

In conclusion, do I like the SFD-2? You had better believe it. I think it is the best D/A converter I have had so far, and it has brought me untold musical pleasure and delight. Do go out and buy one of these, and discover the delights of good digital sound for yourself!

*Bascom H. King*

## the ultimate surround sound

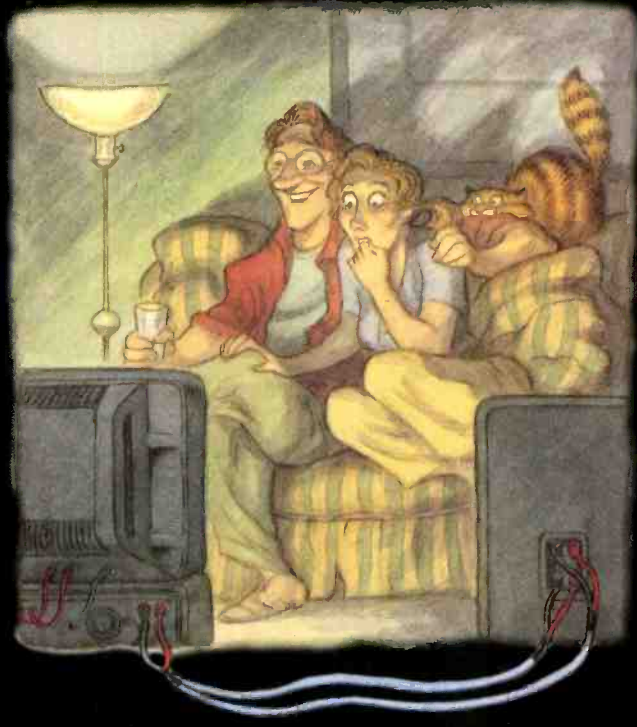
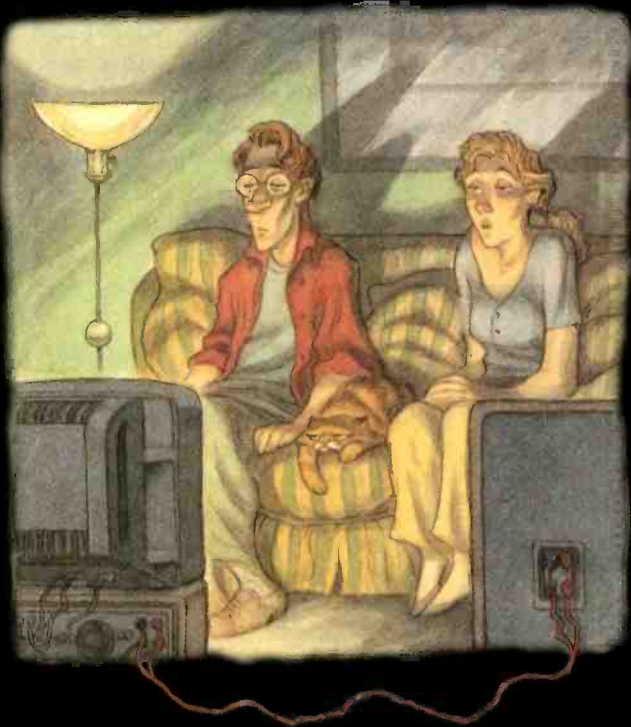
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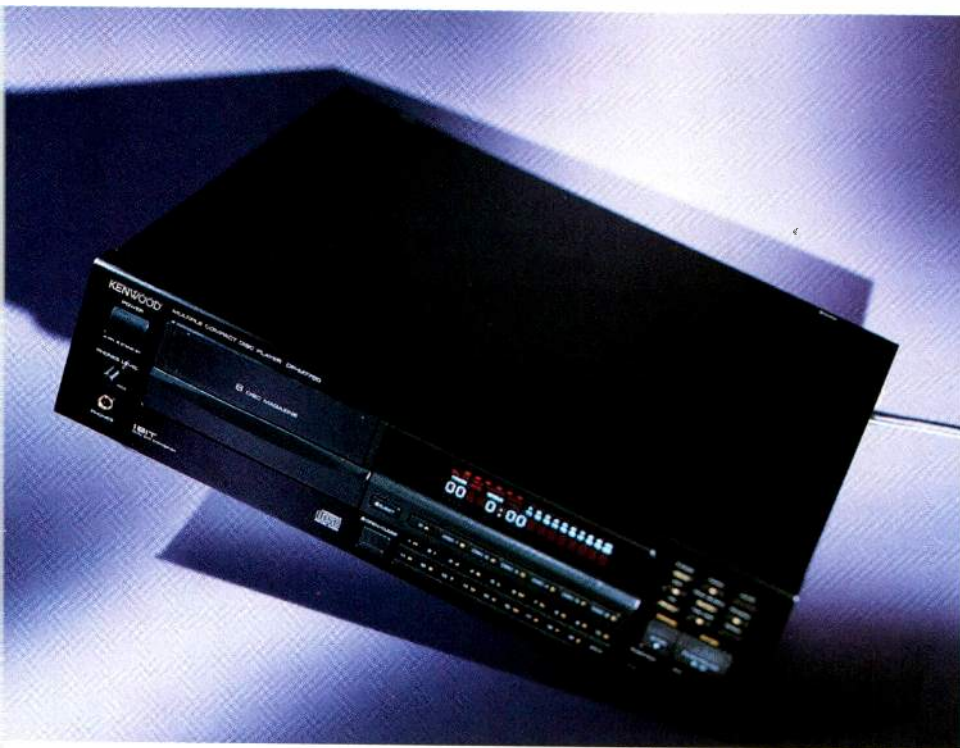
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# KENWOOD DP-M7750 CD CHANGER



**A**t first glance, Kenwood's DP-M7750 seems conventional—just another CD changer with a six-disc magazine and a single-disc tray—but conventional it is not. It is the first *computer-controlled* 6 + 1 changer that's crossed my bench, and for me that sets it apart from the crowd. In fact, it's fair to say computer control is the DP-M7750's most distinguishing feature. Yet I found it surprising that, unless a salesperson explained the feature to you (or you had mighty sharp eyes), you'd be hard pressed to know it exists. The only reference I found in the owner's manual appears on the back-panel line drawing on page 8, where a callout for the DB-25 RS-232C jack simply states: "For the U.S.A. only. This connector is for use in connection with an IBM PC (or compatible) using the software floppy disk FD-M7750 available as an optional accessory."

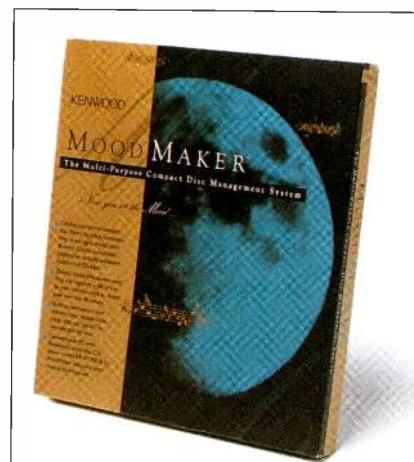
I expect that the disk referred to is Kenwood's MoodMaker Version 2.0, a software

package to catalog and manage your music library and, if you have the DP-M7750, control the player from a PC. To use the software, you'll need an IBM-compatible computer running Windows 3.1 under MS-DOS 5.0 (or higher) and have installed the standard line of Windows TrueType fonts. Kenwood recommends that the software run on at least a 20-MHz 386SX platform with 4 megabytes of RAM; I've yet to find software that didn't benefit from more power, speed, and RAM. You'll also need a bus or serial mouse (a bus mouse is recommended), a VGA or SVGA monitor, and at least 4 megabytes of room on your hard disk. If you use MoodMaker to operate the DP-M7750, you'll also need a free serial port (or a switch box to share a port with whatever's using it now) and a serial interface cable to lash the two together. MoodMaker is provided on a 3½-inch floppy (no indication of it being available on 5¼), so you'll also need a compatible drive in the computer to load it initially.

Since MoodMaker is designed to be used with the DP-M7750 (even though it can be used simply as a music-oriented relational database), it catalogs CDs in six disc clusters. The file for each disc is organized on the basis of disc title, artist, and composer as well as on the basis of track title and artist. You also can append notes to categorize CDs by type of music and can "rate" each CD on a scale of 1 to 5.

As a relational database, MoodMaker searches for specific words that appear in the title, artist, and composer fields. The title and track databases are scanned separately, as requested, when initiating a search. (The search is case-sensitive; you won't find "love" if you ask for "Love.") If you search on the basis of CD title, the magazine numbers and CD titles that match the criteria appear on the screen. If you search the track data, the magazine numbers, CD titles, and track names will appear.

MoodMaker also facilitates compiling play lists of similar music based on the search criteria you've given it. The preprogrammed list can be sent directly to the DP-M7750, but, of course, you will have to have loaded the appropriate magazine, since the database will presumably contain many more discs than the player can handle at once. This reinforces the desirability of placing similar CDs in the same magazine. MoodMaker's control screen also permits you to operate the DP-M7750 from your computer (all functions can be controlled via the serial port), and it displays the CD and track title that's being played on the computer screen. You can even store cover art or graphics for display, provided they're available as .BMP or .DIB files.



Photos: Michael Croen



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### Control Layout

But enough about MoodMaker. On to the DP-M7750 itself, which has enough panel buttons to keep the busiest centipede happy. On the upper left is a jumbo "Power" button and, beneath it, a "Phones Level" control and a gold-plated "Phones" jack. At the lower right are the main transport controls: "Stop," "Play/Pause," and conventional up/down skip and search keys (all of which have dual functions) and "Function" and "Display" buttons (which I'll describe later).

Immediately beneath the display and just to the right of the single-disc tray are seven equally spaced buttons that select the disc for playback: "P" for the one in the single-disc tray and six buttons further to the right for those in the magazine. Slightly to the left is the magazine "Eject" button and, below it, the tray's "Open/Close." To its

right is an array of 20 keys to be used for track selection.

The "Function" button mentioned previously permits magazines and discs to be named and permits programs to be stored in, and recalled from, the DP-M7750's internal memory. The names and programs of up to 42 magazines, including the names of 255 CDs, can be registered in the DP-M7750 and displayed on its panel. There's a limit of eight characters per designation. Characters are entered via the seven disc-select buttons and the first 19 numeric keys, which together cover the 26-character English alphabet. Certain typographical symbols can be entered with the track search and skip keys.

The nine buttons above the transport controls serve a variety of purposes. Some involve the DP-M7750's programming and editing features; others, however, strike me as logically unrelated. For example, although I can come up with a rationale for having the "Random" button in the cluster (the DP-M7750 can randomize playback of any disc, magazine, or program group), the button that activates the player's peak-search function (for tape recording) also lies here. All but two of these buttons ("Repeat" and "Clear") have dual purposes, which further complicates usage. What it all comes down to is that Kenwood has loaded this player with so many features that selection becomes difficult—and for that very reason, they probably will not be used.

Thank you, I'll gladly forgo the mixed benefits of Kenwood's 47-button main panel (86 buttons if you count those with dual purposes twice) for the blessed simplicity of its 31-button remote. Even 31 keys sound like a lot for simple-minded folk like me, until you figure that 17 of them are numeric pads for disc and track selection. Another two open/close and select the single-disc tray, and six more operate the transport—all second nature to every audiophile. That leaves just a half dozen buttons to contend with: "Random," "Repeat," "Time Disp.," "Check," "Clear," and "P.Mode." The first three are pretty

conventional; the latter three are used for programming.

### Measurements

Kenwood claims to employ dual D/A converters in the DP-M7750, and based on the interchannel phase measurement I made, I have no reason to dispute the issue, since phase error was less than 1° from 20 Hz to 20 kHz. Kenwood also claims that the converters use eight-times-oversampled filters and one-bit conversion, but I suspect that, compared with high-end one-bit systems, Kenwood's digital filters have relatively few taps. As you can see in the

frequency response curves of Fig. 1, there's measurable high-end ripple and a modest treble boost. Nevertheless, the response is within -0.04, +0.33 dB across the band—which isn't all that bad, and far better

**USING MOODMAKER SOFTWARE, THIS CD CHANGER CAN HAVE DISC TITLES PROGRAMMED INTO A DATABASE.**

than Kenwood's ±1 dB tolerance. And the two channels are extremely well balanced, within ±0.005 dB.

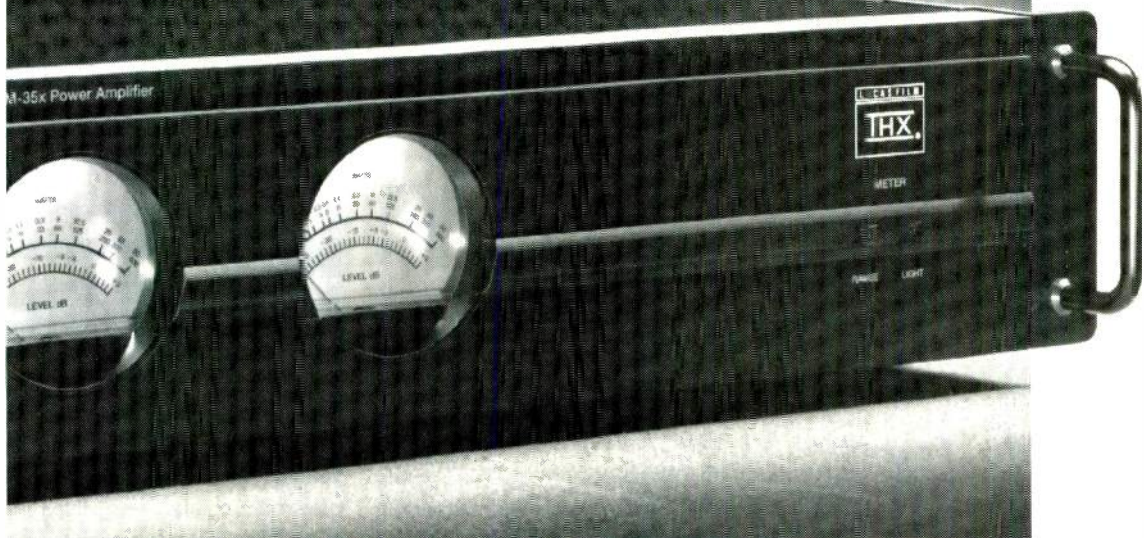
With 0-dB recordings, THD + N was virtually identical on both channels; only the left is plotted in Fig. 2. The distortion and noise are shown in dB versus frequency rather than as a percentage. Converted to percentages, the numbers come out to be 0.005% from 20 to about 200 Hz, above which the residual contamination falls to a minimum of 0.0025% at 1 kHz, only half of Kenwood's 0.005% specification. At higher frequencies, distortion rises fairly rapidly and reaches 0.039% at 10 kHz and 0.48% at 20 kHz. These figures are rather higher than I'd like to see and may be caused by the analog output stages rather than by the converter itself.

Linearity error (Fig. 3) is a bit less on the right channel than on the left but is essentially nonexistent down to the -60 dB recorded level on both channels. At -70 dB, the error is -0.27 dB on the left channel (-0.11 dB on the right) and increases to -1.33 and -1.00 dB (left and right, respectively) at -80 dB. At -90 dB, left-channel error is -4.58 dB without dither (-5.22 dB with), while the right channel is -3.22 dB without dither (-3.80 dB with). Not long

## SPECS

**Frequency Response:** 4 Hz to 20 kHz, ±1 dB.  
**S/N:** Greater than 96 dB.  
**Dynamic Range:** Greater than 94 dB.  
**THD:** Less than 0.005% at 1 kHz.  
**Channel Separation:** Greater than 90 dB at 1 kHz.  
**Wow & Flutter:** Unmeasurable.  
**Output Levels and Impedances:** Fixed, 2.0 V/3.3 kilohms; headphone, 20 mW maximum/16 ohms.  
**D/A Conversion:** One-bit.  
**Oversampling:** Eight-times.  
**Power Consumption:** 15 watts.  
**Dimensions:** 17<sup>3</sup>/<sub>8</sub> in. W x 5<sup>1</sup>/<sub>2</sub> in. H x 14<sup>1</sup>/<sub>2</sub> in. D (44 cm x 12.8 cm x 36.8 cm).  
**Weight:** 11.9 lbs. (5.4 kg).  
**Price:** \$399.  
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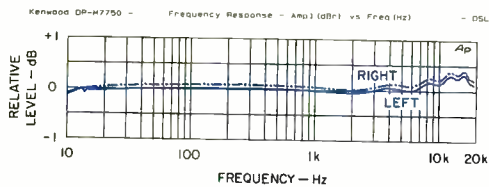
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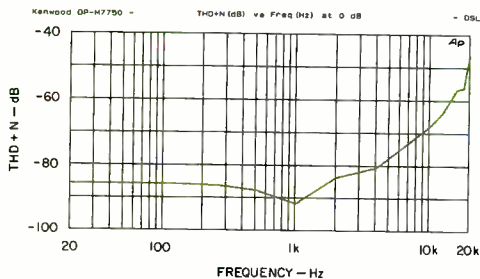
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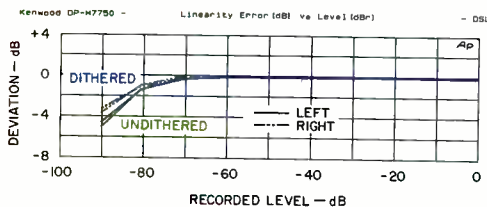
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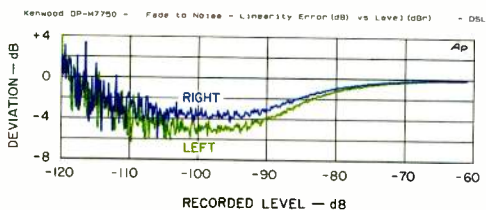
**Fig. 1—Frequency response.**



**Fig. 2—THD + N vs. frequency.**



**Fig. 3—Linearity error.**



**Fig. 4—Fade-to-noise test.**

ago, these would have been excellent results; in today's "one-bit" world, they're not. The fade-to-noise linearity error curves (Fig. 4) extend down to -120 dB and tell a similar tale (right channel somewhat better than the left), but now we can see that the linearity error doesn't get much worse at lower levels than it is for signals at -90 dB.

With the possible exception of high-frequency distortion (assuming that the rather poor figures measured in that area were due to the analog circuitry), the DP-M7750's analog section is exemplary. Channel separation (which is affected more by the layout of the analog circuitry than anything else) was better than 93 dB from right channel to left across the entire

test band and 72.8 dB or better from left to right. At 1 kHz (Kenwood's test point), separation in either direction was 92.5 dB or better, which easily clears spec.

The A-weighted signal-to-noise ratio (which also really measures analog performance, since the converter is not exercised) was a spectacular 128 dB referenced to a 0-dB recording. A spectral analysis of the noise indicated specific components existed only at the power-supply ripple frequency (120 Hz) and its second harmonic. Even these were exceedingly low: -116 dB at 120 Hz and -128 dB at 240 Hz, referenced to the 0-dB level. Quantization noise (which does include converter effects) averaged only 86 dB below the 0-dB reference, so it's clear that the converters, not the analog stages, set the noise floor of this system.

Dynamic range takes converter distortion and noise into account. When measured on an A-weighted basis in accordance with EIAJ standards, it clocked in at 95.8 dB on the left channel and 97.2 dB on the right, both better than Kenwood's 94-dB claim. Unweighted, the numbers became 92.3 and 92.6 dB, respectively.

Output at the rear-panel RCA jacks was a higher-than-typical 2.56 V (0-dB recording at 1 kHz). Output impedance measured a relatively high 3 kilohms, suggesting that you should not use connecting cables longer than necessary. With the "Phones Level" control at maximum, 2.49 V (open circuit) were available at the headphone jack with a source impedance of 69 ohms. You can expect more than adequate drive for the average consumer headset (about 22 mW into 50 ohms) and a reasonable 8.3 mW into 600-ohm ("high-impedance") headphones.

#### Use and Listening Tests

If you're the type who slams the doors of a new car in the showroom hoping to be reassured that the construction is solid, you may not cotton to the Kenwood DP-M7750. Like most other magazine chang-

ers that are based on a mostly plastic transport, this one is rather noisy when loading or changing discs. The thin sheet-metal housing doesn't do much to add to a feeling of solidity either. And I found the skip and search buttons less than positive in action. Ultimately, they always did work, but sometimes I had to press twice to get the desired result, and sometimes I'd get a double skip on what I thought had been a single tap. I'm not sure what kind of switches Kenwood uses—there's a circuit board right up against the control panel—but considering the number of buttons and the proximity of the circuit board, I expect they use either membrane switches or even

**THE A-WEIGHTED S/N  
WAS A SPECTACULAR  
128 dB, REFERENCED TO  
A 0-dB RECORDING.**

contacts made directly to circuit-board traces. Such is the price of packing lots of features into a relatively inexpensive component.

When it comes to listening, let's face it, most CD players sound pretty good. So does the Kenwood DP-M7750. But it didn't approach the sound quality of my one-bit reference player. On piano, the bass was rather tubby and somewhat indistinct, the tenor a bit zingy, and the treble brittle. Violins tended to be wiry, piccolos overly shrill. On the positive side, the DP-M7750 struck me as being admirably quiet, especially on some older "audiophile" CDs that may have been recorded without dither. (Undithered recordings are a mixed blessing; they tend to be quiet, but ambience often is lost.)

Overall, I consider the Kenwood DP-M7750 to be an average CD changer with wads of toys, not least of which is computerized operation. Computer hackers turned audiophiles should love it. So will non-computer audiophiles who like to spend their leisure hours punching in their disc library character by character. If you fit into neither category, you'll probably want a more-standard single-disc CD player.

*Edward J. Foster*



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Pictured, the AP-1, one of five DIGITAL PHASE systems with patented Acousta-Reed technology.

# LUXMAN M-383 AMP AND C-383 PREAMP



**T**he C-383 preamplifier and M-383 power amplifier are at the top of Luxman's current 300 series, a line of components more affordable than the Ultimate series. (The Ultimate series has some intriguing pieces that I may want to review in the future, e.g., the MA-88 mono tube power amp.) The models in the 300 series have a built-in "Line Phase Sensor" that checks whether the a.c. line plug is plugged in with the polarity that minimizes leakage from the line to the chassis; minimizing leakage usually corresponds to getting subtly better sound. These models also have a bidirectional system bus, which allows for more extensive control of interconnected Luxman components. For example, if you press the "CD Synchro" button on the preamp, and the matching CD player and cassette deck are in the system, the

CD player will stop at the end of the last song that can fit completely onto the tape you are recording, so that the tape does not run out in mid-song. Multiroom remote control is also available, provided you use optional accessories.

### Circuit Description

In Luxman's literature, the C-383 preamp is said to minimize the length of the audio signal path by keeping the audio circuits away from the front panel and using long shafts from the front-panel controls to the actual switches and potentiometers. The motorized volume control is said to be superior to active signal attenuators. Separate windings on the power transformer isolate the analog power supply and audio signal circuitry from the digital supply that powers the control microprocessor. This preamp also has video switching, with high-grade video buffers for each input, and allows for two audio/video inputs, a VCR input and output, and a TV monitor output.

### PREAMP

Frequency Response: Phono (RIAA), 20 Hz to 20 kHz, +0, -3 dB; line, 10 Hz to 100 kHz, +0.2, -0.8 dB.

THD: 0.003% for 2-V, 1-kHz signal at CD input.

S/N, IHF A-Weighted: MM phono, 91 dB; MC phono, 76 dB; line, 106 dB for 2-V input.

Input Sensitivity: MM phono, 2.5 mV; MC phono, 200  $\mu$ V; line, 150 mV; video, 1 V, peak to peak.

Input Impedance: MM phono, 47 kilohms; MC phono, 100 ohms; line, 47 kilohms; video, 75 ohms.

Output Level: 1.0 V at pre-out jack.

Output Impedance: 20 ohms at pre-out jack.

Tone-Control Range: Bass,  $\pm 8$  dB at 100 Hz; treble,  $\pm 8$  dB at 10 kHz.

Loudness Compensation: +6 dB at 100 Hz, +4 dB at 10 kHz.

Dimensions: 17 $\frac{1}{8}$  in. W x 4 $\frac{7}{8}$  in. H x 14 $\frac{1}{8}$  in. D (43.8 cm x 12.5 cm x 36.3 cm).

Weight: 15.4 lbs. (7 kg).

Price: \$1,200.

### AMP

Power Output, 8-Ohm Loads:

Continuous (rms), 200 watts per channel, 20 Hz to 20 kHz, at 0.04% THD; dynamic, 300 watts per channel; bridged mono, 700 watts at clipping.

Frequency Response: 10 Hz to 100 kHz, +0, -1 dB.

S/N, IHF A-Weighted: 126 dB.

THD: 0.008% at 1 kHz for 200 watts into 8 ohms.

Input Sensitivity: 1 V.

Input Impedance: 45 kilohms.

Dimensions: 17 $\frac{1}{8}$  in. W x 7 in. H x 16 $\frac{1}{8}$  in. D (43.8 cm x 17.8 cm x 43.1 cm).

Weight: 39 lbs. (17.7 kg).

Price: \$2,000.

Company Address: 915 Washington Ave. South, Minneapolis, Minn. 55415.

For literature, circle No. 94



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AVR-1500

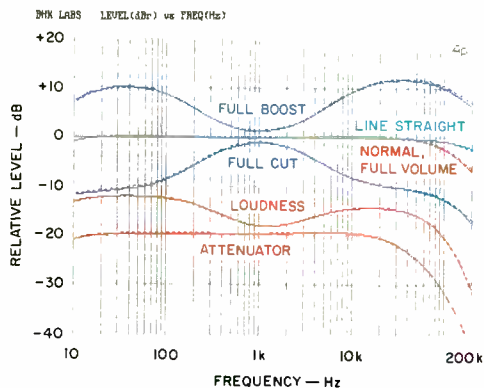


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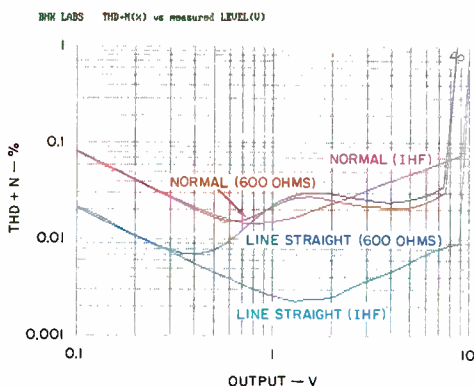
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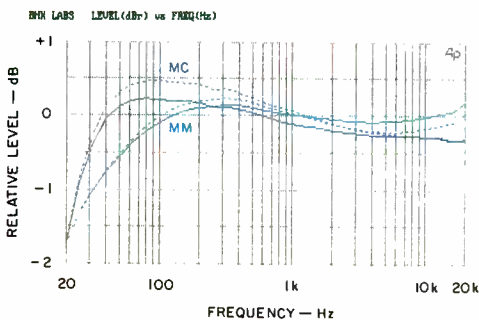
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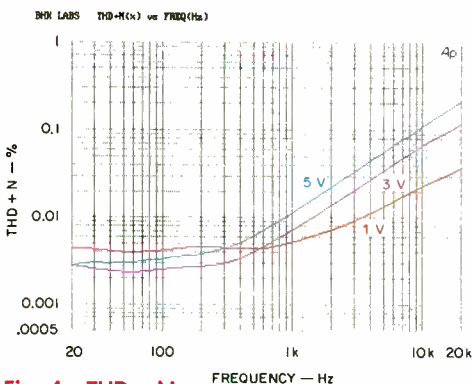
**Fig. 1—Frequency responses, tone-control range, and loudness compensation of C-383 preamp.**



**Fig. 2—THD + N vs. output, C-383 preamp.**



**Fig. 3—RIAA equalization error.**



**Fig. 4—THD + N vs. frequency, MM phono.**

I am just going to touch on what I consider the significant highlights of this preamp's extensive circuitry. All the audio gain blocks are implemented with IC op-amps. Input-signal and tape-monitor selection are accomplished with solid-state analog-switch ICs, whereas the switching after signal selection is done with a combination of actual switches and relays. In the normal operating mode, the selected signal passes through the stereo/mono switch, the "Balance" control, and a unity-gain noninverting buffer and then out to the "Signal Processor" output jacks. Coming back in, via the "Signal Processor" input jacks (normally connected to the processor-out jacks by jumpers), the signal continues on its way through the tone-control amplifier, the  $-20$  dB attenuator, volume and loudness-compensation circuits, and finally through the line-amplifier gain block and the main output jacks. (Whew! I'm not so sure about Luxman's minimizing of the signal path!) In the "Line Straight" mode, simplicity fares somewhat better: The selected signal is routed to the  $-20$  dB attenuator and continues to the main output jacks via only the "Volume Control," "Loudness" switch, and output amplifier.

The control microprocessor and associated digital control circuits are on a p.c. board behind the front panel. It is protected from the audio circuitry on the main p.c. board by a metal shield on the back side of the control board. This is a good and sensible way to isolate the digital control circuitry.

The M-383 power amp uses "All-Stage Symmetrical Push-Pull" circuitry (translation: complementary symmetry), along with a "Duo-Beta" topology that permits low amounts of overall negative feedback along with good d.c.-offset stability. Star power distribution (independent supply lines to each circuit), independent left and

right "Input Level" controls and "Clipping Indicator" LEDs, two speaker-selector buttons, and a remote power on/off facility round out the features of the power amp.

Circuitry in the M-383 is mostly composed of discrete bipolar devices. The input stage, which I deduce is a complementary differential amplifier, is in the form of an IC containing either bipolar or junction FET transistors. The rest of the circuitry is of the familiar complementary topology, consisting of a last voltage amplifier driving a triple Darlington-connected, emitter-follower output stage utilizing three

**LUXMAN'S C-383 PREAMP HAS VIDEO SWITCHING AND ALLOWS MULTIROOM REMOTE CONTROL.**

pairs of output devices per channel. Each channel is powered by its own rectifier bridge and filter capacitors but fed from one common secondary winding on the power transformer.

The novel optimum a.c. line-polarity detector is simplicity itself. What is set as the low side of the unit's a.c. internal wiring goes through a high-value resistor (4.7 megohms) in series with a neon bulb to a touch plate on the back panel. When you touch this plate, your capacitance to ground apparently causes enough current to flow to light the bulb. If this is the case, you reverse the polarity of the a.c. line plug in the socket. This would be especially simple if each a.c. line plug had equal-width blades; the C-383's plug does, but the M-383's does not. What's a person to do? You could either trim the wide tab on the neutral blade of the plug with some heavy-duty wire cutters or use a three-wire to two-wire adaptor and cut off the excess width of its neutral blade. Luxman, however, points out that it's safer in the long run to rewire the a.c. outlet.

Construction and build quality of these pieces is typical of Japanese equipment in this price range, with rather thin-gauge sheet metal, reasonable parts quality, and adequate—if not elegant—quality wiring and construction.

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## Measurements

Gains and IHF sensitivities for the various input and output combinations of the Luxman C-383 preamplifier are enumerated in Tables IA and IB.

A series of frequency responses (not shown) were taken of both channels with the preamp in its normal mode. As is typical for most preamps, the high-frequency response was most extended when the "Volume Control" was at maximum (where the response was 3 dB down at about 67 kHz). With volume down about 40 dB, the high-frequency response approached that with volume at maximum. In the "Line Straight" mode, the preamp's high-frequency bandwidth (-3 dB point) was greater than in the normal mode. Rise- and fall-times with volume at maximum and at an output level of  $\pm 5$  V were 2.8  $\mu$ S and 1.5  $\mu$ S, respectively, for normal and "Line Straight" modes. With the volume control at -6 dB, these rise-times lengthened to 5.5 and 5.0  $\mu$ S, respectively.

Frequency responses for various conditions are shown in Fig. 1 for both channels. One pair of curves shows the effects of the tone controls in normal mode; other curves show the differences in response for the normal and "Line Straight" modes with the tone controls set flat. The "Attenuator" curve, at -20 dB, is for volume at maximum in normal mode with the "Attenuator" button engaged. Finally, the remaining curve is the result of pushing in the "Loudness" button when volume is set at -20 dB. Square-wave responses (not shown) all displayed the effects of, and correlate with, the various frequency responses discussed above. A 20-Hz square wave showed considerable tilt in the normal mode and none in the "Line Straight" mode.

Figure 2 plots distortion at 20 kHz as a function of output voltage, for normal and "Line Straight" modes, instrument/IHF loads (whose effects were essentially the same), and 600-ohm loads. Results are shown for the right channel only, as distortion there was slightly higher than for the left channel. Distortion and noise were somewhat lower in the "Line Straight" mode than with the normal loads (instrument/IHF), and performance into 600-ohm loads was very similar in both modes for output voltages above about 1 V. Measured distortion performance of this unit is quite good, and the C-383 appears to drive a 600-ohm load handily.

Interchannel crosstalk (not shown) with volume at maximum was generally better than 90 dB down at frequencies from 400 Hz to 2 kHz, depending on condition, and rose at 6 dB per octave, in either normal or "Line Straight" mode. End amounts at 20 kHz ranged from about -70 to -58 dB, depending on direction and mode. With the "Volume Control" set to about 20 dB of attenuation (typical of moderate to loud volume settings in a working system), crosstalk increased to some -64 dB at 1 kHz, rising to -40 dB at 20 kHz.

Input resistance for line inputs was 48 kilohms with the "Rec Out Selector" off and 41 kilohms with it set to the selected input. Output resistance was a low 12 ohms in either normal or "Line Straight" mode.

The two channels of the "Volume Control" tracked each other within  $\pm 0.1$  dB from 0 to 33 dB of attenuation, diverging to a difference of about 1.2 dB at the -58 dB setting and 4.5 dB at -75 dB.

Line-amplifier output noise is listed in Table II for normal and "Line Straight" modes; "worst-case" refers to the setting where the noise was highest, usually corresponding to the volume setting 6 dB down from maximum. Noise levels with the worst-case and clockwise volume settings are lower in the "Line Straight" mode. This

**Table IA—Gain levels for C-383 preamplifier.**

	Gain, dB			
	LEFT		RIGHT	
	Instr. Load	IHF Load	Instr. Load	IHF Load
<i>Normal Mode</i>				
CD to Main Out	16.1	16.1	16.2	16.2
<i>"Line Straight" Mode</i>				
CD to Main Out	16.4	16.4	16.4	16.3
CD to Tape Out	-0.1	-0.6	-0.1	-0.6
Phono to Main Out				
MM	51.8	51.8	52.0	52.0
MC	73.8	73.7	73.9	73.9
Phono to Tape Out				
MM	35.7	35.2	35.7	35.2
MC	57.5	57.0	57.7	57.2

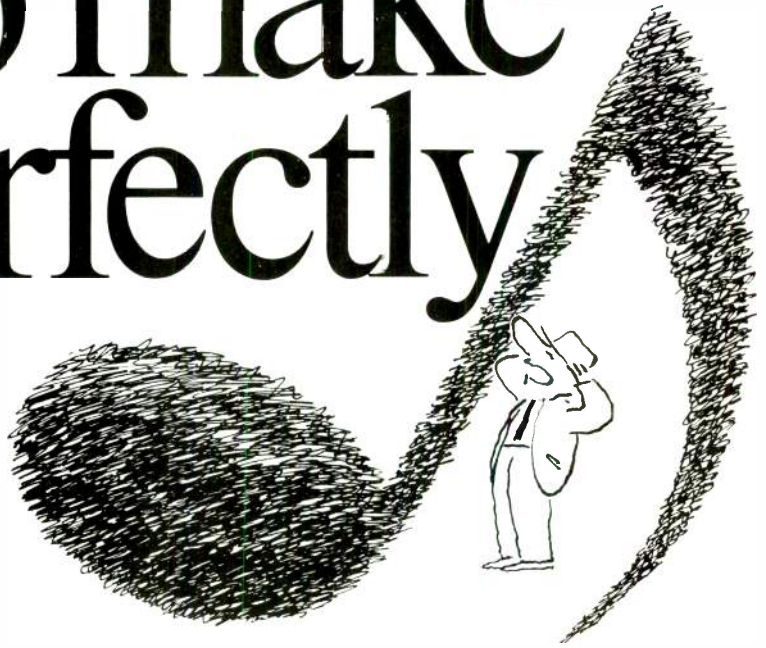
**Table IB—Input sensitivities for C-383 preamplifier, with IHF loading.**

	IHF Sensitivity	
	LEFT	RIGHT
<i>Normal Mode</i>		
CD to Main Out	78.2 mV	77.2 mV
<i>"Line Straight" Mode</i>		
CD to Main Out	76.0 mV	76.2 mV
CD to Tape Out	534.6 mV	534.6 mV
Phono to Main Out		
MM	1.28 mV	1.26 mV
MC	102.7 $\mu$ V	100.7 $\mu$ V
Phono to Tape Out		
MM	8.68 mV	8.67 mV
MC	0.70 mV	0.69 mV

**Table II—Output noise levels of C-383 preamplifier's line-amp section for counterclockwise (CCW), worst-case (WC, typically -6 dB), and full clockwise (CW) settings of "Volume Control." IHF S/N figures for left and right channels are 89.2 and 89.8 dB, respectively, in normal mode and are 89.7 and 89.4 dB, respectively, in "Line Straight" mode.**

Bandwidth	Output Noise, $\mu$ V					
	LEFT			RIGHT		
	CCW	WC	CW	CCW	WC	CW
<i>Normal Mode</i>						
Wideband	55.0	152.4	152.4	53.4	152.5	152.5
22 Hz to 22 kHz	13.6	51.0	51.0	13.3	52.0	52.0
400 Hz to 22 kHz	13.1	50.0	50.0	13.0	50.2	50.2
A-Weighted	10.2	38.2	38.2	10.0	38.5	38.5
<i>"Line Straight" Mode</i>						
Wideband	56.9	77.6	59.9	53.4	72.7	57.4
22 Hz to 22 kHz	13.6	21.5	13.8	13.3	21.1	14.0
400 Hz to 22 kHz	13.1	20.6	13.4	12.9	20.7	13.6
A-Weighted	10.0	16.0	10.7	9.8	15.8	10.4

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—Lewis Lipnick, *Stereophile*, Vol. 11 No. 4, April 1988.

Recommended accessory in *Stereophile*, Vol. 12 No. 4, April 1989.

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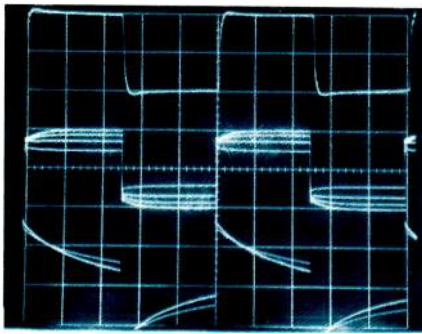
—Ken Pohlman, *AUDIO*, November 1987.

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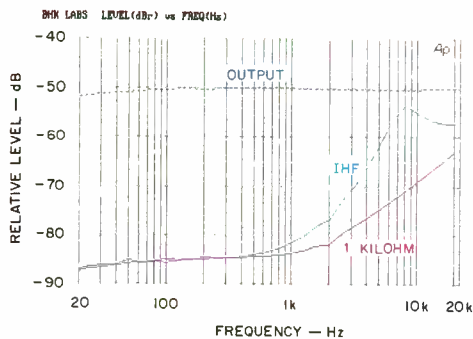


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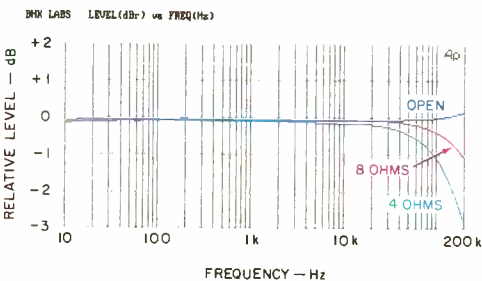
details you can hear



**Fig. 5—Square-wave response, MM phono, for 10 kHz (top), 1 kHz at varying drive levels (middle), and 40 Hz with instrument and IHF loads (bottom).**



**Fig. 6—MM phono response and crosstalk.**



**Fig. 7—Frequency response of M-383 amp.**

is because the normal mode puts the tone-control amplifier between the source and the “Volume Control,” thereby adding its noise with the volume up but having no effect with the volume down.

Figure 3 shows RIAA equalization error for the phono preamp’s MM and MC modes. Data is shown for instrument loading; IHF loading dropped the levels about 0.5 dB but didn’t alter the curve shapes. There is a considerable difference in the two modes’ equalization error below 200 Hz that I can’t account for in the circuitry.

The low-frequency roll-off was probably intentional, to help reduce spurious subsonic energy. Personally, I prefer a design that has flat low-frequency equalization response, with an option to apply a subsonic filter (if need be) for a particularly warped record.

Total harmonic distortion in the MM mode for the left channel is plotted in Fig. 4 for output levels of 1, 3, and 5 V rms for instrument loading. Distortion can be seen to rise at high frequencies. Usually, distortion in a feedback equalizer is lower at high frequencies, where there is more loop gain. In this circuit, what appears to be heavy high-frequency open-loop roll-off compensation (as judged from the phono equalizer’s schematic) seems to result in reduced loop gain at high frequencies, which would account for the rise in distortion with frequency. The IHF load didn’t materially affect the distortion results shown. In the MC mode, the distortion at 5 V output was about the same as that in Fig. 4 above some 2 kHz; it was limited by measurement-system noise below about 700 to 800 Hz.

In measuring phono overload versus frequency, using a pre-equalized sine-wave source, I ran into some difficulty at high frequencies. For this test, my Audio Precision System One’s generator produces the RIAA pre-equalized signal and regulates its amplitude to produce a constant measured 3% THD at each test frequency; the resultant input and output voltage from the phono preamp under test is then measured. If the preamp handles all frequencies equally, the attainable output should be flat with frequency, and the input voltage which produces that constant output will be the inverse of the RIAA equalization curve. When the C-383’s phono preamp was pushed to clipping, high-frequency instability (in the range from 10 to 20 kHz) manifested itself as a low-frequency oscillation that prevented the Audio Precision detector from settling

down for a legitimate reading. What I was able to get was an essentially constant 10 V rms, with either instrument or IHF loading, from about 30 Hz to 10 kHz in both MM and MC modes. Since the input acceptance at 1 kHz is about 170 mV in MM mode and some 28 mV in MC mode, it is exceedingly unlikely that the C-383’s phono equalizer would be overloaded by any normal or even high-output phono cartridge.

Scope waveforms of MM phono response to square waves are shown in Fig. 5. The top trace is for 10 kHz with instrument loading; vertical sensitivity is 0.5 V/division. With IHF loading, output dropped slightly and rise-time increased from 1.8 to 2.6  $\mu$ s. The middle trace, for 1 kHz and trace sensitivity of 1 V/division, shows the high-frequency compression that takes place as the output is driven to levels above about 1 V, peak to peak. The

**IMAGING AND SPATIAL PROPERTIES WERE QUITE GOOD, TONAL BALANCE FINE, AND EDGINESS ACCEPTABLY LOW.**

compression behavior was reasonably symmetrical, which is desirable. The bottom trace is for 40 Hz, with instrument and IHF loading; the IHF load produces the greater tilt. In the MC mode, high-frequency compression was much less, allowing the C-383 to deliver more than twice the output it did in the MM mode before compression became visible. However, rise-time was somewhat slower, at about 5  $\mu$ s. Also, the 1-kHz square wave is flatter, without the overshoot at lower levels visible in the middle trace of Fig. 5.

Phono interchannel crosstalk is plotted in Fig. 6 for the MM mode. One solid curve shows crosstalk with the input of the undriven, measured channel terminated with a 1-kilohm load; the other solid curve shows the results with the IHF moving-magnet source as a termination. Results were about the same in both directions. In the MC mode, the crosstalk was a flat -65 dB in both directions with a 100-ohm termination resistor but, strangely, was quite a



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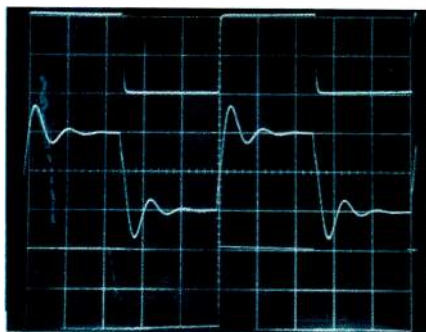
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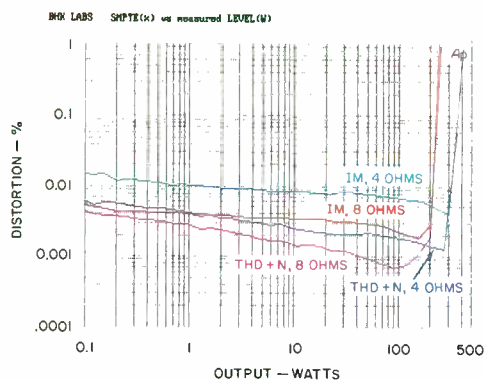
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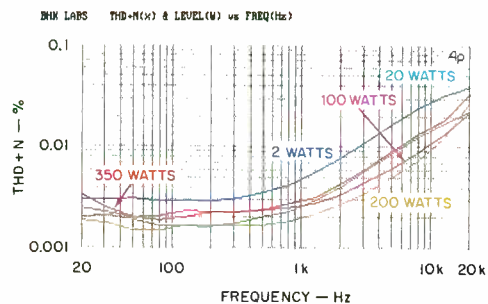
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**Fig. 8—Amp square-wave response for 10 kHz into 8-ohm load (top), 10 kHz into 8 ohms paralleled by 2  $\mu$ F (middle), and 40 Hz into 8 ohms (bottom).**



**Fig. 9—Amp THD + N at 1 kHz and SMPTe IM vs. power.**



**Fig. 10—Amp THD + N vs. frequency with 4-ohm loads.**

bit lower at mid-frequencies when the un-driven channel was not terminated.

Phono referred input noise, along with IHF S/N ratios for the whole preamplifier in both phono modes, are given in Table III for different source impedances and bandwidths.

I didn't test the preamp's video switching, external remote sensor, or remote-control "Bus Line" functions.

Voltage gains and sensitivities for the M-383 power amplifier were 28.9 and 28.8 dB for the left and right channels, respectively, with corresponding IHF sensitivities of 101.3 and 102.3 mV. Gain was about 6 dB higher than the usual 26 dB.

Frequency response as a function of load is plotted in Fig. 7. As can be seen, high-frequency bandwidth relates strongly to resistive loading. Response with speaker systems having moving-coil tweeters, but lacking impedance-compensating networks that keep high-frequency impedance down, will likely look more like the curve for open-circuit loading. The open-circuit response appears to be peaking at a frequency above the 200-kHz limit of the plot.

Figure 8 shows square-wave responses. In the top trace, for 10 kHz into an 8-ohm load, everything looks good and well behaved; rise- and fall-times are about 1  $\mu$ S. With a paralleled 2- $\mu$ F capacitor (middle trace), there is ringing behavior typical of most transistor amplifiers. In the 40-Hz trace (bottom), the tilt is very slight, indicating extended infrasonic response.

Figure 9 shows SMPTe-IM distortion and 1-kHz THD + N, as a function of power output, with 4- and 8-ohm loading for the left channel. Figure 10 shows THD + N as a function of frequency, for various power levels into 4-ohm loads. A spectrum of harmonic distortion for a 1-kHz signal at 10 watts output into 8 ohms (not shown) revealed mostly even-order distortion, with a descending envelope of harmonic amplitude versus harmonic number. Typically, when the dominant harmonics are even, the amount of total harmonic distortion versus power output at a particular frequency is relatively constant at all power levels up to clipping; this is shown in Fig. 10 to be more or less the case.

Damping factor at 100 Hz was 247 and 234 for the right and left channels, respec-

tively. As with many power amplifiers, damping factor started to decrease at 300 to 400 Hz and reached a final value of about 29 at 20 kHz.

This amp's interchannel crosstalk was higher in the right-to-left direction. Crosstalk increased over most of the audio range at 6 dB/octave, indicating capacitive coupling between the channels. The amount was about -97 dB at 1 kHz, increasing to about -73 dB at 20 kHz. Crosstalk in the left-to-right direction was some 12 to 13 dB better.

Output noise levels, along with IHF S/N ratios, are given in Table IV. The noise level is very low, and no sign of the line-harmonic background that I saw in the distortion-spectrum plot shows up here.

**I HADN'T EXPECTED THE LUXMANS TO SOUND AS GOOD AS MY BEST GEAR, BUT I WAS PLEASANTLY SURPRISED.**

Dynamic power measurements with 8-ohm loads yielded an equivalent output of 306 watts at the beginning of the 20-mS burst period and 289 watts at the end of the burst. For 4-ohm loads, the results were 578 and 512 watts, respectively. Based on the higher power at the beginning of the burst, IHF dynamic headroom computes out to 1.85 and 2.18 dB for 8- and 4-ohm loads, respectively. Continuous maximum power output at the visual onset of clipping was 225 and 324 watts, respectively, for 8- and 4-ohm loads.

The a.c. line draw was 360 mA. This indicates a relatively low output-stage idling current.

#### Use and Listening Tests

Digital signal sources used in my reference system during the review period included Counterpoint DA-11A and PS Audio Lambda CD Drive transports feeding Sonic Frontiers SFD-2 and other (experimental) D/A converters. For analog sources, I used an Oracle Audio turntable fitted with a Well Tempered Lab tonearm and a Spectral Audio MCR-1 Select moving-coil pickup, feeding a Vendetta

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# PART ONE – MULTIPLE CHOICE

**Table III**—Phono referred input noise for C-383 preamplifier with short-circuited and loaded inputs. Loading was 100 ohms in MC mode and IHF simulated moving-magnet load in MM mode. IHF S/N ratios for either channel, with inputs loaded as above, are 75.0 dB in MC mode and 78.0 dB in MM mode.

MC Gain	Referred Input Noise, nV			
	LEFT		RIGHT	
	Shorted	100 Ohms	Shorted	100 Ohms
Wideband	178.0	178.0	158.0	178.0
22 Hz to 22 kHz	158.0	178.0	141.0	178.0
400 Hz to 22 kHz	71.0	89.0	71.0	89.0
A-Weighted	71.0	89.0	71.0	89.0

MM Gain	Referred Input Noise, nV			
	Shorted	IHF	Shorted	IHF
Wideband	292.0		266.0	
22 Hz to 22 kHz	224.0		200.0	
400 Hz to 22 kHz	116.0		116.0	
A-Weighted	116.0	631.0	116.0	631.0

**Table IV**—Output noise levels for M-383 power amplifier. IHF S/N ratios are 100.0 and 97.7 dB, respectively, for the left and right channels.

Bandwidth	Output Noise, $\mu$ V	
	LEFT	RIGHT
Wideband	138.0	150.0
22 Hz to 22 kHz	38.0	50.0
400 Hz to 22 kHz	36.0	45.0
A-Weighted	28.0	37.0

Research SCP-2C phono preamp. I also used Nakamichi's ST-7 FM tuner and 250 cassette recorder and a Technics open-reel recorder. Other preamplifiers used included a unit from Quicksilver Audio, a Forsell tube line driver, and a First Sound Reference II. Other power amplifiers on hand were a Crown Macro Reference, Quicksilver M-135s, and an Arnoux MB300A switching design. Loudspeakers used were B & W 801 Matrix Series 3s, augmented in the range from 20 to 50 Hz by a pair of experimental subwoofer systems, each using a JBL 1400Nd driver in a 5-cubic-foot ported enclosure.

When I first received the Luxman equipment, I tried out the M-383 power amplifier in my system. My listening notes indicate that it sounded quite good but was a little dull and closed in compared to my highest resolution amplifiers. On the other hand, it didn't sound edgy or irritating.

After measuring the Luxman units, I connected up both the preamp and the power amp in my system and just started listening to different signal sources. I must

sign was that, as I listened to various types of music, I didn't have an itch to get back to "the good stuff."

Operationally, everything worked without any bothersome problems. Once, when I was listening to phono, the preamp muted when I switched on my subwoofer amp. Although the manual indicates one just has to touch the a.c. line-polarity detector's plate to operate it, I found that I had to ground the plate with a wire or clip-lead to a grounded piece of equipment in order for the indicator to light when the polarity was wrong. Although I didn't regularly use most of the remote's many features, I particularly liked having remote control of signal source, volume, and muting. I do wish that the remote had a balance function, as that really enables one to completely dial in a particular recording from the listening position.

In summary, I find the Luxman C-383 and M-383 to be musically satisfying, and I urge prospective buyers of separates in this price range to give them a listen.

*Bascom H. King*

admit I had a predisposition to think that the sonic qualities of this pair wouldn't be in the same league as that of some of the reference equipment I normally use. Well, I was pleasantly surprised and found, much to my delight, that music issued forth in a very listenable manner. I found myself saying "Boy, that sounds good" more than a few times. Imaging and spatial properties were quite good, with tonal balance generally like the balance I am used to with my reference equipment. Edginess and irritation levels, an aspect of reproduction to which I am hypersensitive, were acceptably low. A good

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## The Obvious Choice



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See Part II of the exam on page 109  
and Part III on page 115.  
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ANSWERS: 1-E, 2-D, 3-F

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**W**hen you think about it, there is a surprisingly long list of high-end firms whose product excellence we all take for granted. You know, even before you open the box, that quality will be high in terms of design features, construction, and sound. You know the manufacturer's track record, and if you are considering a line-stage preamp and/or amplifier, you can be almost certain the sound will be at least very good and that the measured frequency response

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and distortion will be so good that you can't possibly relate them to perceived sound quality. Audio Research is one of those manufacturers. I could begin virtually every review of Audio Research equipment with the comment "Another fine pre-amplifier" or "Another fine amplifier."

Yet it takes a certain indifference to reality to claim that Audio Research products sound just the same as my Krell, Pass Laboratories, or Classé Audio reference preamps and amplifiers—or that they sound the same

as the preamps and amps of other leading high-end manufacturers whose products are designed around a different perception of musicality. The differences in sound may be ones of nuance, but they are the kind of differences that make a high-end system into a personal statement of how the owner defines the sound of music.

Furthermore, no one who has had any experience with the products of a well-established high-end manufacturer fails to hear changes over time—changes that are almost always for the better. Audio Research is again a good case in point. The company earned world-wide recognition by producing equipment that created a new interest in tube designs at a time when the rest of the audio world was rushing—perhaps prematurely—into transistors.

Audio Research, however, has come a long way from the era when tube sound meant considerable warmth, a loss of tightness and control in the deep bass, and a tendency toward slightly rolled-off highs. In fact, the days when tubes were "warm" and solid-state devices were "dry" have been over for at least half a decade. Longtime firms such as Audio Research have shown that tube electronics can provide both the sweetness and exceptional dynamic life of top tube designs and the flat frequency response and bass power and control of the best transistor designs. Further, Audio Research has expanded to become a

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top solid-state manufacturer while remaining a top manufacturer of tube equipment. The Audio Research LS2B Mark II preamp and

D300 power amplifier are both good examples of this process of evolution. The preamplifier sells for \$2,650 in its basic configuration (the LS2 Mark II), \$2,995 with balanced

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## PART TWO – TRUE OR FALSE

T or F 1. "...the Majik-I is one cone kicker of an amplifier...give it a listen...I'll guarantee you'll be impressed." *Hi-Fi World*

T or F 2. "...our use of the Linn Majik-I was an unalloyed pleasure. The smoothness and silence with which it's controls operated were striking...We could not resist opening up the Majik-I. Its interior can only be described as gem-like." *Stereo Review*

T or F 3. "...the Linn Majik can serve as the heart of a robust and uncompromising home audiophile system." *The Common-Sense Audiophile*

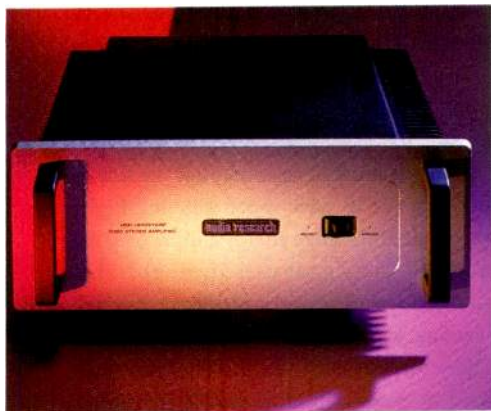
Everything  
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# LINN MAJIK



See Part I of the exam on page 107 and  
Part III on page 115.  
For additional information call  
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inputs (the LS2B Mark II), and \$3,495 with both balanced inputs and a remote control. It is a hybrid tube and solid-state line-stage preamplifier that uses FET devices for its input and output circuitry and 6922 dual triodes as its main gain amplifier. The 6922, incidentally, is one of the many benefits of the end of the cold war. It is a Russian-made tube that Audio Research finds has exceptional reliability and long life.

Audio Research emphasizes during design implementation the systematic selection of the best-sounding components, as well as solid technical engineering, but the LS2B Mark II does have a number of especially interesting design features. The Mark II in the model name of the preamp indicates that amplified feedback is used to provide buffering and to avoid loading down the output. The unit provides 18 dB of gain and is a true Class-A circuit capable of swinging 50 V of output, peak to peak. FETs are used as constant-current devices to get improved linearity and power-supply regulation.

As is increasingly common with modern preamps, a great deal of engineering effort has gone into designing the power supply. Audio Research's engineers believe that in the past, power-supply limitations—not



solid-state devices—were responsible for much of the dryness and lack of dynamics that used to be associated with "transistor sound." Two power transformers are used; the smaller transformer feeds and effectively isolates the active balanced input circuit. It uses advanced coaxial capacitors and decoupled electrolytic-capacitor networks. A new generation of ICs is used for error control in the regulators, and even the low-voltage regulators use current-feedback devices rather than op-amps.

The Audio Research LS2B Mark II is a minimalist preamp in terms of features. You have a choice of five high-level inputs, a "Gain" control, and "Power" and muting switches. The rest of the control layout clearly emphasizes sonic purity, at the cost of eliminating the balance control and tape-monitor switch. You do, however, get a front-panel tape-defeat control that bypasses the tape output circuitry and prevents any risk of interaction with a tape

THE LS2B PRESERVES  
THE EXCEPTIONAL  
DYNAMIC LIFE  
AND RESOLUTION OF  
THE BEST TUBE SOUND.

deck. A "Direct/Normal" input switch allows you to bypass the switching circuitry for the balanced "Direct" input on the back—adding another element of sonic purity. Further, the balanced input on the LS2B Mark II has a 3-megohm input impedance, which Audio Research feels reduces the loading on source equipment and both opens up the sound and provides better musical integrity.

The sound character of the LS2B Mark II is as you might expect from this design emphasis. Its sound is very clean, very detailed, and very transparent. There is no particular warmth or character of timbre, and no coloration in the bass, midrange, or treble. The LS2B Mark II clearly emphasizes neutrality over any euphonic kind of coloration, a neutrality that will delight some tube fans but disappoint others.

Any former Audio Research SP11 owner—and I am one—is going to find that the LS2B Mark II does an excellent job of



**AUDIO RESEARCH'S LS2B  
AND D300 MAKE  
A SUPERB COMBINATION,  
OFFERING MUCH OF  
THE BEST IN SOUND.**

preserving some of the best in tube sound. It has the exceptional dynamic life that I, at least, expect from the best tube preamps, and it combines outstanding dynamics with outstanding resolution. In contrast, even some of the best transistor gear tends to slightly soften dynamics and the natural energy of music, particularly at low levels or in complex passages.

Some preamps have more apparent depth, but few sound more open or do a better job of imaging. The soundstage is very live and open, with excellent left-to-right spread and well-focused imaging. Further, imaging is not artificially fixed in place, or spotlighted, and it is very good from front to back as well as excellent from left to right. The soundstage was good enough to make me forget the absence of a balance control—at least, most of the time. I normally like to lock in the imaging and soundstage of a given record or CD with small adjustments to the balance control, but I only missed this capability with a few unbalanced recordings.

In short, the Audio Research LS2B Mark II gives you accuracy and not romance. This preamplifier will never dazzle you with features or woo you with some pleasing coloration. What it will do is provide

an outstanding mixture of the best in tube and solid-state sound.

The D300 stereo amp is a bit more conventional, at least in the sense that it is all solid-state. It sells for \$3,995 and provides 160 watts per channel into 8 ohms and 300 watts into 4 ohms. It can be bridged to provide 600 watts into 8 ohms and 900 watts into 4 ohms. The power bandwidth ranges from d.c. to 150 kHz into 8 ohms, and noise is rated at 116 dB below output. The damping factor is a relatively high 130, the slew rate is 50  $\mu\text{V}/\text{S}$ , and the rise-time is 1.7  $\mu\text{V}$ . The input impedance is 150 kilohms unbalanced and 300 kilohms balanced; the amp is noninverting.

There are no front-panel features other than an off/on switch and two lights that indicate whether the amplifier is in "Operate" or "Protect" mode. The rear panel has two RCA inputs, two balanced XLR inputs, two sets of stereo binding posts, the usual fuse-holder, and switches to select the balanced or unbalanced inputs.

The design philosophy and sound of the Audio Research D300 bear a striking resemblance to those of the LS2B Mark II preamp. The circuit and components were chosen on the basis of exhaustive listening tests, with the goal of providing as much as possible of the openness, clarity, and dynamic life that Audio Research feels are the great strengths of tubes.

Like the LS2B Mark II preamp, the D300 uses constant-current devices and a complex power supply with distributed electrolytics and premium components. A higher voltage, or rail, with a capacitance multiplier (or ripple stripper) is used in the lower gain stage in order to provide more open dynamics.

The D300 blends the use of J-FETs and bipolar transistors in what Audio Research believes is the best-sounding use of each device. There are no MOS-FETs in the active audio circuitry. The D300 uses direct-coupled, high-current multiple-emitter transistors in the output stages, which Audio Research feels have the ruggedness of single-emitter bipolar devices and the sweetness of MOS-FETs. The D300 uses plastic output devices—not because they are cheaper than metal devices, but because Audio Research feels they sound better. The subsonic limiting and protection circuitry are chosen to sound neutral.

As for sound character, the D300 is very similar to the LS2B Mark II. The D300 has a very fast, live, and dynamic attack and an open soundstage. It does not warm the sound, add extra bass power, or alter timbre, although it is clean enough so that it may appear to have more detailed highs and upper midrange energy simply because more of the signal gets through. This added upper octave transparency is a real blessing with today's best CD players and D/A converters but is unforgiving with hard or excessively close-miked recordings and poor CD players or converters.

The apparent S/N is also excellent. Like a lot of today's best high-end equipment, the music seems clean at lower signal levels, emerging with less of the vestigial electronic "haze" or noise you sense with older equipment, even equipment that has excellent overall S/N.

The Audio Research D300 did an exceptional job of getting the best out of difficult speakers. It performed very well with a low-impedance ribbon speaker, a Quad electrostatic, the Spendor BC-1, and the Thiel CS5i. In fact, the D300 got some of the best performance out of the Thiel CS5i that I have yet heard from any amplifier.

By any standard, the Audio Research LS2B Mark II and D300 make an outstanding combination, one that offers much of the best in tube sound. You also have a wide range of potential choices in prices and power. I prefer balanced inputs, but choosing the LS2 Mark II over the LS2B Mark II offers substantial savings, and a remote control is a luxury that contributes nothing to sound quality. Similarly, the D300 is part of a family of amplifiers that includes the D400 Mark II, with 200 watts per channel and a price of \$5,495, and the D200 with 110 watts per channel and a price of \$2,495. If you are on a budget, the cheaper combination may be a great deal more appealing.

Do remember, however, that audio is a sport that is based on careful comparative auditioning. There is no one right answer to reproducing the illusion of live music, and the nuances in top high-end electronics are considerably subtler than those in speakers. You'll miss half the fun in buying audio equipment if you don't listen to a range of products like the LS2B Mark II and the D300. *Anthony H. Cordesman*



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## SPICA TC-60 SPEAKER



**S**mall bookshelf monitors involve inevitable compromises. There are severe limits to the bass energy and extension they can deliver relative to floor-standing speakers, and this forces the designer to make trade-offs. Far too often, the speakers either lack bass or have an audible boost in the upper bass that col-

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ors all of the music reproduced through them. Although they seem like speakers that can be placed conveniently on shelves or furniture, this often ruins their soundstage and presents still further problems in the bass response. Unless bookshelf speakers come with dedicated speaker stands, serious problems can occur in their effective frequency response

**SPICA'S TC-60  
PERFORMS MAGIC  
AT A GENUINELY  
AFFORDABLE  
PRICE LEVEL.**

at the listening position. This is because the height and angle of the front of the speaker relative to the listener determines the timing and amount of reflected energy that reaches the listener's ear.

There are, however, small monitors that have a special magic. Ever since the coming of the BBC-designed LS3/5a, it has been clear that a really well-designed small speaker, placed on the proper stand and at the right height, can act as an apparent point source and produce an excellent soundstage. It has also been apparent that with the right set of design trade-offs, a speaker can apparently produce much more bass than is actually there, and that a really clean and musical midrange response can make up for a multitude of smaller technical evils.

The art of loudspeaker design has since moved far beyond the LS3/5a, and a few firms (such as Wilson Audio) have raised the design of small speakers to a level of musicality that once seemed unimaginable—although not without a high price tag (the Wilson Watt costs at least \$7,450 a pair). A number of other firms, like Spica, have been able to perform their own magic at a much more affordable level. The Spica TC-60, for example, sells for \$795 a pair, although the real price tag should include another \$250 per pair for the rigid Gravity stands necessary to help the TC-60 achieve its best bass response and ensure it is at the right height and angle to perform at its best.

Yet despite the TC-60's moderate price, this speaker does have some

interesting design features and specifications. It is a bit larger than most small monitors are (11½ inches wide x 21¼ inches high x 10½ inches deep), and has a sloping

front panel to ensure time coherence of the tweeter and woofer and to correct for delays created by the

Photos: Michael Groen

# From the mind and soul of Bob Carver, a new company—and a new amplifier.



**Yes**, after 14 years, Bob Carver has left Carver Corporation, the company he founded and nurtured. Said Bob, "I wanted to start a smaller company, the kind I really like." That company is Sunfire Corporation.

Now, as you know, Bob Carver created the dominant amp of the '70s, the Phase Linear 400, as well as the dominant amp of the '80s, the Carver M-400 magnetic field amplifier, and also the "amp of the decade," the mighty Silver Seven vacuum-tube amplifier. You would think, therefore, that the amplifier that launches his new company must be quite special. Indeed, the new Sunfire amplifier may well define the art for the rest of this century.

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The Sunfire can produce 600 watts rms per channel into 4 ohms and it can do so continuously.\* Into 2 ohms and 1 ohm, it can deliver, respectively, 1200 watts and 2400 watts rms on a time-limited basis, and its peak-to-peak current output capability is 138 amperes! This enormous current is supplied by 24 massive Motorola triple-diffused output devices, each capable of 20 amperes with current to spare. The intrinsic frequency response extends from dc to beyond 0.25 megahertz. Its distortion is orders of magnitude below audibility, with the profile of a classic vacuum tube amplifier.

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The big breakthrough feature of the Sunfire amplifier is its uncanny tracking downconverter, which uses 12

herculean International Rectifier Hexfets. This downconverter provides the seemingly magical gift that allows the amplifier to drive *any* load to *any* rationally usable current or voltage level.

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We've included two kinds of outputs: (1) a standard voltage-source (i.e., near zero impedance) output for all typical applications and (2) a higher-impedance current-source output, specially suited for electrostatic, planar magnetic, or ribbon speakers. Or, and this is the second best part, you can biwire your speaker with the voltage source driving the woofer(s) and the current source driving the upper part of the system. (In many cases this provides by far the best possible interface between the amplifier and the speaker system.) You can even select gold RCA standard inputs or gold XLR balanced inputs. Your options are practically unlimited.

Whichever way you decide to hook up the Sunfire power amp, it will create a multilayered soundstage that is deep, wide, three-dimensional, and utterly believable. And, thanks to the optional current-source output, its musical voice can be as soft, sumptuous, and delicately detailed as you wish. (The slight current-source characteristic of vacuum tubes is the dominant factor in the soundstage delivery of classic tube amplifiers.) And the bass "slam" or "whack" with all that available current is, well, not to be believed. But don't believe us, go to your nearest Sunfire dealer and see for yourself.

\* E.T.C.: 300 watts continuous per channel, both channels driven into 8 ohms from 20 Hz to 20 kHz with no more than 0.5% THD  
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crossover. The TC-60 uses a ported enclosure with a QB3 alignment. The polarity of both drivers is positive, and the baffles are designed to extend the tweeter response smoothly down to lower frequencies while blending the output of the tweeter and midrange in the crossover region. A thick acoustic blanket around the drivers minimizes cabinet diffraction and the reflection of unwanted sounds into the listening area.

The TC-60's frequency response is specified as -3 dB from 48 Hz to 20 kHz, which is flatter than that of most small speakers, and it is specified to be consistent at inputs ranging from as little as 0.1 V to as much as 10 V. The vast majority of small speakers changes significantly in frequency response with changes in power, and many have

**THE TC-60'S RESPONSE  
IS NOTABLY CONSISTENT  
WITH LEVEL CHANGES,  
FROM SOFTEST STRINGS  
TO FULL ORCHESTRA.**

their best response at some particular listening level. The frequency response of the TC-60 is exceptionally consistent, from the softest string passages to loud orchestral passages.

The crossover has a fourth-order Bessel acoustic response for the 6½-inch polypropylene woofer and a computer-derived first-order crossover for the 1-inch cloth dome tweeter. The TC-60s are symmetrically mirror-imaged and matched in pairs to improve imaging and consistency.

I need to balance my praise for the TC-60 with some important qualifications, most of which apply to every speaker this size. This kind of speaker performs at its best in small- to medium-size listening rooms. Its bass and power-handling capabilities do not suit it for large listening rooms, any more than the characteristics of large monitors suit them for small listening rooms. As with all speakers, the performance of the TC-60 is sensitive to placement relative to rear and side walls. Like most speakers, it needs to be kept well away from the side walls. Careful experimentation is needed to place it at just the right distance from the rear wall in a given

room to give it the best combination of bass and midrange response. The TC-60s are more sensitive to this than most speakers.

You have to pay the same attention to other aspects of setup that you do with virtually all small speakers. In the real world, you can't mount speakers in bookshelves or on furniture without a major sacrifice in performance. You need to use the TC-60 with a top-quality speaker stand, and you need to place the TC-60s well away from any furniture and with a clear line of sight from each speaker to the listening position. The TC-60 also performs best when positioned slightly lower than the listener's ear, and its ideal listening area is not all that wide. You need to experiment with speaker-to-listener distance and with the distance between speakers to find the triangle that gives you the best possible soundstage and listening position. Finally, you need a bit of patience. The TC-60 takes time to break in—a week of listening to reach its best, I found.

If this need for careful setup sounds a bit daunting, it should not. All speakers need this kind of care and attention, and I can promise you that the TC-60 will reward you for your efforts. Designer John Bau's previous speaker, the TC-50, won a considerable reputation for the quality of its midrange, its coherence, and its excellent soundstaging, but the TC-60 is better in every way. It has one of the most musical midranges I have ever heard in its price range (including its stand), and its dynamics are vastly improved over the TC-50. This is a small speaker that sounds "big" and "live" when played at anything like reasonable volume levels. Equally important, you do not need to raise the gain with very soft passages. They come through very clearly, as they do in a live performance.

The TC-60 does not have true deep bass (no speaker its size does), but it still does a good job of reproducing the bass viol and percussion. The TC-60 is not the speaker for organ fanatics or those who like the lower range of the synthesizer, but its frequency response extends low enough so that you do not hear an obtrusive bass bump. At the same time, this speaker does not have the artificial clarity of those small monitors that appear to have more treble and upper midrange detail simply because they are weak in terms of bass.

## PART THREE – EXTRA CREDIT

If you can correctly answer the following three questions we will send you a Linn Majik information packet, the name of your local Linn dealer, and a gift certificate redeemable for a free Linn CD when you audition the Linn Majik control amplifier.

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See Part I of the exam on page 107 and  
Part II on page 109.

The overall timbre of the TC-60 was well balanced, with just enough warmth to avoid the leanness of some small speakers. Male and female voices were very good, although soprano voice had some slight coloration in the upper registers (a coloration that was significantly reduced after break-in). I also found the treble to be smooth and extended, though somewhat beamy, and the TC-60 required considerable experimentation in placement before the upper octaves integrated smoothly with the rest of the sound. You may find tilting the

front of the speaker slightly up or down relative to your listening height will also help lock in best performance.

The TC-60s did a surprisingly good job of getting the best out of recent Sheffield, Mobile Fidelity, and Chesky LPs, even in comparison with Apogee Studio Grands, B & W 801 Matrix Series 3s, and Thiel CS5i's—and these are full-range reference speakers that are up to an order of magnitude more expensive. I was particularly pleased with the TC-60's ability to resolve complex choral passages, and to give solo

percussion instruments, violin, acoustic guitar, and piano the illusion of the life, dynamics, and detail that you hear in live performances.

Transient response was very good, and percussion detail was quick and very well defined. The Spicas performed very well with the Chesky test CDs, easily revealing the differences in the comparisons between dirty and clean power, analog and digital tape, and digital sound techniques recorded on the Chesky JD 111 test disc. If you are a fan of the superior transient detail on Reference Recordings and Wilson Audio LPs and CDs, you will hear that detail on the TC-60s.

Soundstaging was very good. The imaging was very natural, and the soundstage "floated," rather than clustered, the imaging around the location and height of the speakers. You can get a surprisingly wide soundstage with careful placement of the TC-60s. Depth was very good, although I could not get the resolution of depth from the TC-60s that I have gotten from a number of reference speakers.

The real key to the TC-60's sound is that the sum of its parts has considerable synergy. No speaker made can realistically reproduce the sound of a full symphony orchestra, opera, or rock concert in the home, although some larger monitors give it a damn good try! An outstanding speaker can, however, go a long way toward giving you the illusion of live solo music, a live string quartet, or a live small jazz group. The TC-60s can create this kind of illusion; they are for serious listeners who know the sound of live music and give it the attention it deserves.

"Magic" in a speaker is always relative. No aspect of audio is more personal than choosing a loudspeaker, and no choice should be more dependent on your auditioning a product at length and making your own choice. I believe, however, that classical music fans, and fans of acoustic rock and jazz, are likely to find that the TC-60 does an exceptional job of creating the illusion of a live performance from a small enclosure. There are many good to very good small speakers on the market, but a properly set up Spica TC-60 is one of the rare exceptions that can make you forget its size and let you completely lose yourself in the music.

*Anthony H. Cordesman*

AUDIO/JANUARY 1995

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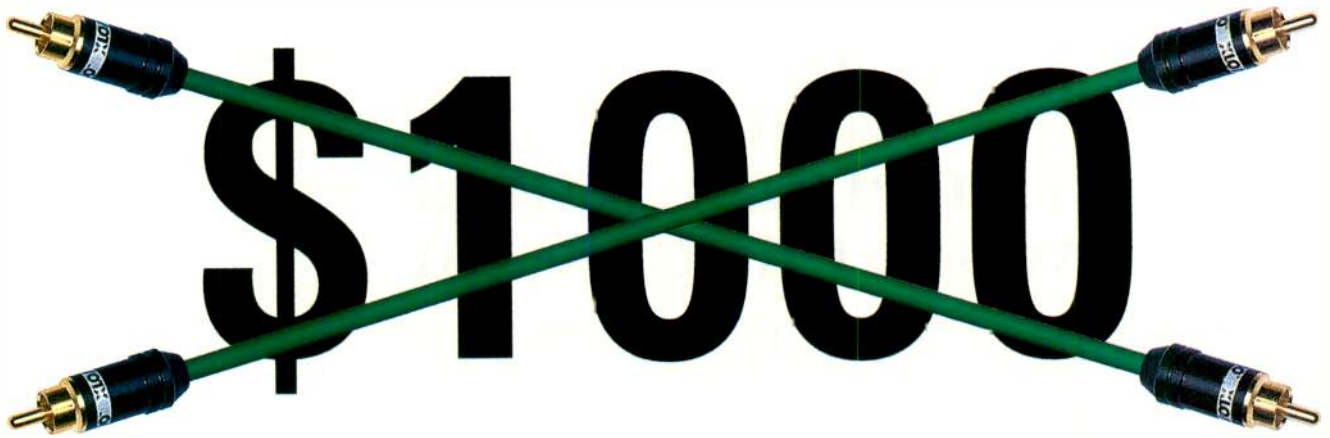
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# HEADROOM SUPREME HEADPHONE AMP & IMAGE PROCESSOR



**M**ontana! As I unpacked the HeadRoom Supreme Headphone Amplifier and Audio Image Processor, I was singing "I come from Montana. I wear a bandanna. My spurs they jingle as I ride along." I knew that there was more going on in the Big Sky country than riding, roping, and branding, but I never expected an audiophile-quality headphone amplifier from there! But since most receivers, cassette machines, and CD players have stereo earphone jacks, why would

anyone want a separate amplifier for earphones?

Tyll Hertsens, president of HeadRoom Corp., once had a job that required a great deal of travelling. Because this led to many hours of listening through earphones, he became acutely aware of the differences between listening with earphones and loudspeakers and did some research to find the cause of these differences. He found some answers and decided to design and build a headphone amplifier to resolve the problems. His goals were: Consis-

tency when using earphones with different sources, more power output, and a cross-feed circuit to improve imaging.

A separate earphone amplifier can be designed to provide a uniform frequency response into the wide range of impedance characteristics of different earphones. It can also be designed to supply more audio power than most sources with built-in 'phone jacks; many CD players, especially portables running on small batteries, necessarily have low-power amplifiers.

The cross-feed circuit is not a new idea, but it is an eminently practical one. It became prominent in the 1960s through work done by Ben Bauer of CBS Labs, and consequently it is sometimes called the Bauer circuit. After you have listened to music with earphones using a cross-feed circuit, you will wonder how you ever got along without it.

An explanation of the difference between loudspeaker and earphone listening will make it clear why a cross-feed circuit is so worthwhile. Let's consider, for example, a recording that has a clarinet predominantly in the left channel and a trumpet in the right. When you listen to this recording with loudspeakers, you will hear the clarinet coming from the left loudspeaker and the trumpet coming from the right loudspeaker. However, you will hear the clarinet and the trumpet with both your left and right ears, albeit with slightly different spectra and at slightly different times. The

clarinet's sound will arrive at your right ear slightly after it arrives at your left; it will also have a reduced high-frequency spectrum due to shadowing

by your head. These spectral and timing clues are what allow you to determine the direction of the sound. When you listen with

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*product against which other amplifiers can be measured. If an amp of equal or greater price isn't at least as good as the HCA-2200", it doesn't cut it."*

It's clear that Mr. Stone has discovered the virtues of our amplifier. And while we're pleased he found the process so enjoyable, we aren't surprised. It's all part of our design philosophy, whose essence he captures nicely when he says, *"...a middle-class audiophile like myself no longer has to take out a second mortgage on his house to afford a musically satisfying amplifier."*

# “...A BENCHMARK PRODUCT AGAINST WHICH OTHER AMPLIFIERS CAN BE MEASURED.”

— STEVEN STONE, *STEREOPHILE*, VOL. 17 No. 3, MARCH 1994

But what did surprise us, as well as flatter us, was being thrown into the ring with \$12,000 monoblock behemoths. The result of this apparently absurd comparison? Not carnage, but rather: *"...the Parasound HCA-2200" gives them all a run for the money, and even beats 'em in flexibility and price."* He continues, *"...a pair of HCA-2200"s performed with Apogee full-ranges on a par with a pair of Boulder 250 AEs and four VTL Deluxe 300 amps. Dynamic impact and attack were excellent...Compared to the VTL300, the HCA-2200" had a greater sense of extension..."*

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earphones, the clarinet will be in your left ear and the trumpet will be in your right, but there will be no clarinet sound in your right ear and no trumpet sound in your left ear. This creates a very unnatural listening condition.

Most recordings also have instruments in the center that will help to direct your attention away from this unnatural effect, but it is still there. The cross-feed circuit alleviates this effect by blending a slightly delayed signal, with a reduced high-frequency spectrum, into the opposite channel; this causes multimiked recordings to sound more natural. Recordings made for earphone listening, with two microphones placed in a dummy head, usually don't need a cross-feed circuit—but such recordings are the exception rather than the rule.

The HeadRoom Supreme has a very good cross-feed circuit. It also has an equalizer filter that can be switched in or out when the cross-feed circuit is switched on. With the filter on, high frequencies in the cross-feed signal are slightly increased. When you order the \$399 Supreme, you will be asked what brand and model earphones you use, the type of music you prefer, and whether you listen at home or while travelling. A technician then adjusts the filter to one of three equalization settings by selecting a resistor and soldering it to the main circuit board. (If you try the Supreme and find it too bright or dark, you can return it to HeadRoom within 30 days; the company will make the appropriate change, at no charge.)

The Supreme has three on/off toggle switches on the front panel—for the cross-feed circuit ("Process/Bypass"), the filter, and power. The ¼-inch earphone jack is on the left side of the front panel, and a volume control is on the right. The rear panel has two recessed line input phono jacks, two battery holders, and a jack for the external 5-V d.c. supply. The HeadRoom Supreme is housed in a solid, extruded aluminum case that is about 5¼ inches wide, 1¾ inches high, and 6 inches deep; the volume control adds about ¾ inch to the depth. The p.c. board has a large slot, in the center, to allow clearance for the two battery holders mounted to the rear panel; each battery holder accepts two AA batteries. (You can expect a little more than an hour of operation with nickel-cadmium

batteries and over 2 hours with alkalines. You can increase this to over 20 hours if you operate the Supreme from the accessory battery holder, which houses four D cells.) There are 25 parts on the circuit board, including a d.c.-to-d.c. converter (that provides +15 and -15 V from a 5-V input) and the encapsulated, two-channel circuit module which is the heart of the amplifier.

The basic amp and processor module is sold separately for those who would like to build their own earphone amplifier; it costs \$89. HeadRoom will even help you by supplying schematics, parts lists, and sources.

**FOR THOSE WHO ENJOY  
MUSIC VIA EARPHONES,  
THE HEADROOM SUPREME  
IS ONE OF THE BEST  
THINGS TO COME ALONG.**

You could put the module into a receiver, preamp, etc. whose power supply provides 12 to 15 V of positive and negative d.c. In fact, one of Tyll Hertsens' goals is to make an IC version of the HeadRoom circuit that audio manufacturers will be able to put into their products.

Rated output is 60 mW (maximum output is 400 mW), and the amp will drive earphones with impedances from 10 to 600 ohms. I listened to the Supreme with a pair of earphones that measured 17 ohms, and the combination sounded very good; I heard no problems even when I listened at a very high level. There is plenty of output even for low-sensitivity earphones.

I listened to a wide variety of music with the Supreme while switching the cross-feed and the filter in and out. Most recordings benefited from the cross-feed, and many sounded better with the filter turned on. You can usually tell that the cross-feed will make the sound more natural if an instrument can be heard in one ear and hardly at all in the other. For example, Dave Grusin's *Discovered Again* (Sheffield CD-5) sounded much better with the cross-feed and filter switched on. The cross-feed and filter also made "Wishing Well" on the Schönherz and Scott album, *One Night in Vienna* (Windham Hill WD-1060), sound more natural. But "Bourbon Street Parade," an

Al Hirt cut on *Dixieland's Greatest Hits* (First Choice FC 4512), benefited from the cross-feed but sounded better with the filter off. Many rock and jazz recordings are made with very little cross-feed on some instruments, and these will definitely sound better with the cross-feed on.

Recordings that sound great without the cross-feed switched in are rare and are usually made by people who use earphones to check the sound, such as Tom Jung of dmp or Craig Dory and Brian Peters of Dorian. Chuck Loeb's "One Man's View" from *Simple Things* (dmp CD-504) sounded excellent with the cross-feed turned off, as did Pergolesi's *Stabat Mater* on Dorian (DOR-90196). "La Bamba," on *Lift Off* (dmp CD-498), was only slightly enhanced by the cross-feed.

There are some recordings that have adequate cross-feed between channels but can still be enhanced with the Supreme's cross-feed circuit. I have recorded in the Alice Millar Chapel at Northwestern University, where the Millar Brass Ensemble was recorded (Koss CD-1011). The long and narrow hall is very bright and reverberant, but the brightness of the brass instruments was tamed, and the imaging improved slightly, with the Supreme's cross-feed on and its filter switched off. Some recordings made with a dummy head in a reverberant space can actually sound less natural when the cross-feed switch is on. An example is *Joyce Jones at the Ruffatti Organ in Spivey Hall* on Rosenhaus Records (3525 Carondolet, Waco, Tex. 76710). This recording was engineered by Wade Bray of Head Acoustics, using an Aachen Head augmented by a pair of Schoeps MK-5 omnidirectional microphones. The sound is magnificent. However, with the Supreme's cross-feed, the sound field collapsed slightly and wasn't as natural.

If the last few examples cause you to believe that I think the cross-feed process isn't useful, you are very wrong! The majority of recordings will benefit greatly from it. The HeadRoom Supreme earphone amplifier is portable, has audiophile-quality sound, and doesn't cost a fortune. It is one of the best things that has happened to those of us who enjoy listening to music via earphones.

*Edward M. Long*

# CONRAD-JOHNSON PF2 AND MF2300

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## McINTOSH MC500 AMP AND C40 PREAMP

Unpacking the McIntosh C40 preamp and MC500 amp was like opening the front door and greeting old friends. The first piece of "high-end" equipment I was able to afford was a used McIntosh preamp. I still rely on a slightly modified McIntosh MR71 tuner, a unit that was excellent not only during its heyday but long afterward.

The C40 and MC500 have the features and styling I am accustomed to expect from McIntosh. While Mac equipment may include the latest technology, its black chassis, feature-filled front panels of the preamps, and illuminated meters on the power amps are all familiar signs that McIntosh designs for the carriage trade rather than for high-end fanatics. McIntosh equipment puts the user in control, instead of imposing the designer's ideas on the buyer.

The McIntosh C40 Control Center is anything but an audio purist's product. For \$3,250 it offers virtually every feature you could want. For example, with the tone controls, you get the equivalent of a small equalizer with five controls centered at 30, 150, 500, 1,500, and 10,000 Hz.

You also get a phono input, eight high-level RCA inputs, one balanced input, and one balanced output. You can control up to three tape recorders. There is a variable loudness control, a switch to choose between various stereo and mono modes, and a compander to expand



or compress the sound. The C40 can use remote relays to switch between two speakers, has a 20-watt stereo headphone and monitor amp, and lets you switch the equalizer and/or compander into the recording circuits. In fact, there are more features than I have space to describe.

Beautifully made, the C40 uses top-grade resistors and capacitors in its sophisticated circuitry, with up-

dated electronic switching of all signals. The phono preamp uses an IC op-amp with a differential input stage that has high open-loop gain; this allows the use of a large amount of negative feedback to reduce noise and distortion and provide precision RIAA equalization. Although the phono preamp does not have the gain and impedance settings to permit the use of low-output moving-

coil cartridges, it does work well with any cartridge of more than 2.5 mV output, is extremely quiet, and can accept up to 90 mV input without overload.

High-level signals go past the input and mode switching and are fed into the loudness-contour amp. An integrated-circuit op-amp is used with two active-feedback loops, one with flat frequency response and

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KEF Q-70

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one with loudness compensation. This circuit provides 20 dB of gain and allows you to choose between zero loudness compensation and whatever level of compensation you have dialed in to match your listening setup. Signals in the "listen" program path go directly to the compander, through the "listen" processor circuit, and then to the volume control, the balance control, and then the equalizer, which feeds the outputs.

The compander uses a voltage-controlled amplifier (VCA) as a variable gain block; control voltages for the VCA are tak-

en from samples of both the left and right input signals. The electronic signal processing includes band-shaping, logarithmic conversion, full-wave rectification, level setting, expansion or compression ratio regulation, attack timing, and d.c. amplification. The resulting processed voltage controls the gain of the VCA to cause logarithmic gain expansion or compression.

You do pay a slight sonic price for all these control features. Although the C40 is rated as having less than 0.002% IM or harmonic distortion, some preamps offer

cleaner and more detailed sound. The C40 is a very good unit, but it does not quite reach the level of transparency and natural dynamic life of its top high-end competition. I also found the loudness control to be largely irrelevant. A modest use of the equalizer controls did a much better job of correcting frequency problems, and I don't like the kind of low-level listening to background music for which the loudness control seems intended. That said, the other features of the C40 offer very real alternatives to the purist approach to preamps.

I know many audiophiles feel that tone controls and equalizers are anathema, but the tone controls on the C40 are truly valuable. A light touch of the midrange controls or a careful adjustment of the low bass control can correct for some speaker or room problems. Like the somewhat similar controls on Cello's Palette preamp/EQ, the controls on the C40 can be very valuable in

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many real-world systems. Further, they are flexible enough to correct timbre problems in a number of recordings—for example, in touching up the sound of old tapes or 33 $\frac{1}{2}$ - and 78-rpm records.

The C40's compander is equally useful. It is unnecessary with many recordings, but a touch of expansion does a surprisingly good job of opening up the sound of many mediocre recordings and giving new life to what may be an old but great performance. It can add life, dynamics, and openness to the soundstage. Similarly, a little compression can add a merciful touch of musical realism to hard-sounding or close-miked recordings. The result may not be exactly what is on the recording, but it does improve the illusion of listening to live music.

In short, the C40 offers excellent features and very good overall sound—with no trace of hardness and just a slight touch of warmth. It is one of the few control centers on the market that can actually play a useful role in improving the sound of music.

AUDIO/JANUARY 1995

124

LEGACY  
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## How Not to Buy an Amplifier.

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In a world where far too many high-end products compete to provide exactly the same features, the C40 stands out as one of the few real alternatives.

The McIntosh MC500 stereo amplifier sells for \$6,250. It is anything but cheap, although it is a powerhouse that delivers 500 watts per channel into 8 or 4 ohms and offers many of the features of McIntosh's top solid-state mono amplifier, the MC1000, for about half the price.

There isn't sufficient space to go into all of the relevant design details and features, but the MC500 is capable of peak currents of 112 amperes, and its harmonic and intermodulation distortion specifications are excellent—less than 0.005% each. It has very sophisticated protection circuitry along with thermal control that eliminates the need for fans and leads to more silent in-room operation. Power Guard circuitry prevents any risk of clipping (and destroying a speaker driver in the process).

The MC500 is also one of the few solid-state amplifiers to use autoformers as output transformers. This ensures that the optimum load is presented to the output transistors, so that extra current doesn't flow and cause extra heating of the power transistors. You also get an optimum match with any normal-impedance speaker. There is protection circuitry to prevent any output transistor's failure from putting d.c. into the autoformer, conducting it instead directly to ground.

The MC500 has balanced and unbalanced inputs, and can be bridged to become a 1,000-watt mono amplifier. Its power on/off switching can be remotely controlled by the C40, and the styling is as good as that of any component I have seen.

The feature I find irresistible, however, is the set of two illuminated 5½-inch meters on the MC500's front panel. Admittedly, I have no idea what use you put these meters to, since your ear is just as useful. Everyone is a sucker for something, however, and I have loved watching needles dance since the days I used to do sound engineering.

This amp has the authoritative power to drive virtually any speaker around and to do so with great dynamic life. It can produce the deep, extended bass you expect from the best power amp, and its midrange is smooth—without upper midrange dryness. This is one amp that has no suckout

in the lower midrange or upper bass, and the upper midrange and treble are detailed, without emphasis or overemphasis.

As with the C40 preamp, you can find electronics that are a bit cleaner sounding, have a slightly better subjective signal-to-noise ratio, and get just a bit more apparent detail out of recordings. There are also amplifiers with larger soundstages and a bit more transient energy. At the same time, the MC500 does an excellent job of striking a golden mean between various sound characteristics. It has the kind of neutral overall balance that makes recordings sound like music. Further, not only was the MC500 compatible with every speaker I tried, but it also had an unusual

**THOUGH MY TASTES LIE  
IN THE PURIST CAMP,  
THE C40 AND MC500  
SHOWED ME THERE'S A  
GOOD CASE FOR LUXURY.**

ability to control speakers in ways that got the best out of their bass performance.

Most of the high-end amplifiers and preamps I review reflect the designer's view of how best to remove every vestigial sonic coloration from the signal path. Like a Ferrari, the result can be extraordinarily exciting, but it is not always the kind of excitement you want to live with on a daily basis. In contrast, the McIntosh C40 and MC500 swing to the beat of a different drummer. They really are "Rolls-Royce" products, substituting luxury for excitement, and are designed to make listening easier.

As an audiophile whose tastes normally lie in the purist camp, I admit that the C40 and MC500 prove there is a great deal to be said for luxury. The purist approach inevitably means inconvenience in terms of room placement, the inability to use controls to correct for minor irregularities in frequency response, and the need to listen to superior recordings to the potential exclusion of less well-recorded but better performances. The McIntosh C40 and MC500 are reminders that audio equipment exists to aid in reproducing music, not vice versa. And then there is the allure of those meters.

*Anthony H. Cordesman*



**TOM JUNG  
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## Westlake Audio

# SONY DTC-2000ES DAT RECORDER



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**T**echnology has not been kind to home recording in recent years. Classic open-reel decks have become something specialist audiophiles rebuild rather than buy. The technology and sound quality of the best CDs and analog records are far beyond the limits of cassette recorders. MiniDisc and DCC have so far contributed nothing to the state of the art, and the sound of these two "new" digital technologies falls well short of the performance that ordinary DAT recorders have provided for several years. In fact, DAT stands

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as today's best way of making top-quality home recordings.

While the small portable DAT units I have tried have their limits, most of the larger decks provide excellent home recordings, on a format whose sound quality is superior to anything other than that of the most expensive professional recorders. Moreover, DAT playback

can be easily upgraded simply by connecting a DAT deck to a high-quality D/A converter. Although many DAT decks have good D/A converters, there is no question that they sound much better played through converters by Krell, Theta Digital, Wadia Digital, etc.

Digital Audio Tape is an underrated and often unappreciated medium. It was introduced in the wrong way, as the new popular format that would replace the cassette—a fantasy in terms of DAT recorders' cost, then and now. Its very real value to music collectors, musicologists, and audiophiles who make their own recordings was largely ignored. Further, little attention was given to packaging DAT recorders with improved microphones, mixers, dubbing decks, and low-cost digital editors that would have encouraged audiophiles to make high-quality home recordings. Nor was any real effort made to market DAT as a way of recording local performances and amateur theater and music. Little effort also seems to have been made to market DAT as a way of providing music and sound effects for low-budget dance, theater, and other performances. I recently had the misfortune of suffering through a performance of a

ballet company and a semi-professional chorale group that thought a slightly off-pitch cassette deck was state of the art; I would vehemently suggest that DAT is a far better solution in supporting performances such as these.

Unfortunately, DAT has little or no commercial software. The initial efforts to sell prerecorded DAT cassettes seem to have died. Thus, there is no point in having a DAT deck in your car or buying a portable playback unit, unless you make your

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own recordings on a DAT deck with record features.

This does not mean that DAT is dead as a consumer product. A growing number of sound engineers and some audiophiles do use DAT decks to make live recordings. I have heard quite a number of home recordings, made with simple miking and without multitracking, which show that there is a great deal to be said for amateur performances and simple recording techniques. Some of these DATs are far more involving, in acoustics and emotional impact, than the overprocessed professionalism of far too many CDs.

Some audiophiles also use DATs to archive records or rare CDs. They have discovered that becoming involved in music—in collecting and comparing performances—is often a great deal more fun than the endless search for another tweak or the perfect components. Then, there is the odd reviewer; I, for one, use a Sony DTC-75ES Digital Audio Tape deck to create tapes that I use to screen the equipment I review.

At the same time, my Sony DTC-75ES DAT deck, and other DAT decks I have tried, have some important sonic defects; they lack the ability to properly resolve low-level detail and dynamics. On the plus side, they have flatter frequency response, lower distortion, and less wow and flutter than analog machines. They have done a good job in recording and playing back medium to loud passages, but they have not done an equal job of reproducing the natural sweetness and air of music. They have had trouble reproducing all of the detail of musical dynamics, and could not record all of the low-level soundstage detail available on the best analog recordings. The result has been a loss of depth and hall

effects. A well-tweaked and restored Revox G36 open-reel analog tape deck—more than two decades old—could do a better job of recording these important aspects of sound quality than DAT machines.

Enter the Sony DTC-2000ES.

This DAT recorder, which sells for \$2,500, incorporates what Sony calls a “high-density, linear A/D converter system” and Sony’s Super Bit Mapping technology. The DTC-2000ES uses a delta-sigma converter in its analog-to-digital stage, like some other DAT decks, but it incorporates separate ICs designed to reduce the noise inherent in single-IC systems. The signal is then fed to a pulse A/D converter, which reduces the quantization noise to a theoretical level of  $-115$  dB and

reduces the aliasing noise without having to introduce steep filtering into the analog circuit. A decimation filter removes unwanted high-frequency elements with digital processing; it is claimed to reduce aliasing noise by up to 120 dB.

Sony has issued a long and detailed technical explanation of this process. Unlike some such claims, you can hear the difference as well as read about it. I have compared the DTC-2000ES to Sony’s DTC-75ES DAT deck, a Sony MiniDisc deck, a Philips DCC machine, tweaked Revox G36 tube and A77 transistor open-reel decks, and a Tandberg TD 20A transistor open-reel deck. The DTC-2000ES decisively outperformed them all.

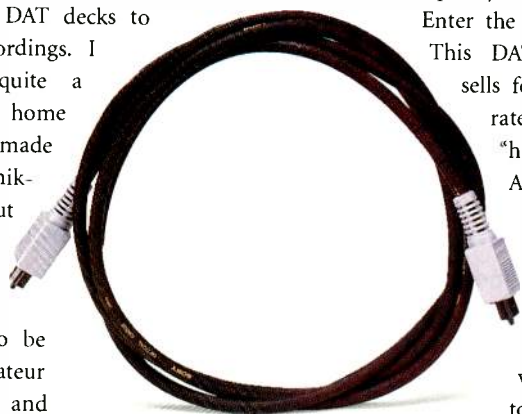
After a few trial recordings, I gave up on DCC and MiniDisc; they simply are not sonically competitive with DAT. The DTC-2000ES clearly outperformed my Sony DTC-75ES. It was almost as if the DTC-2000ES lowered the noise floor by about 10 dB. I found I could hear significantly more detail in dubbing CDs and LPs, and in making some live recordings. Music had more sweetness and air. Dynamics seemed

more natural, and bass had more kick and slam. The soundstage expanded to become much more like the original source, and voices seemed slightly more natural. The low-level sounds that help give recordings of live performances a more natural and lifelike character were also clearer. Even though you may not listen much for rustling scores or chair movements, they are important to ambience.

The Sony DTC-2000ES also outperformed the open-reel tape recorders (and I don’t intend to re-fight the digital-versus-analog battle here). The Sony provided far more accurate frequency response, more speed stability, freedom from tape scrape and mechanical problems, freedom from tape bias and equalization problems, and an absolute absence of hiss and hum. I was particularly impressed by the lack of low- and mid-bass bumps and irregularities that are a reality in even the best consumer-level open-reel decks. The much more natural sense of air and extension in the upper octaves was also impressive. The DTC-2000ES may not provide a euphonic roll-off in the highs, but it does provide accurate highs, with no problems from tape equalization or head effects.

I do not mean to say, however, that the DTC-2000ES provides perfect transparency, for I have never heard any home recording device that did not affect sound quality. While the DTC-2000ES is much better than some, its effects are still audible. This Sony deck has a good FET microphone preamp built in, which I would much rather use than a number of stand-alone consumer or home-studio-level mike preamps. The line-level A/D section of the DTC-2000ES does lose a bit of definition and dynamics and has just a touch of the hardening of recorded sound I associate with transistor electronics of less than top quality. The D/A section’s sound is very listenable but lacks the definition and dynamics the digital output has when played through the latest Krell or Theta Digital D/A converters. I would much rather use the DTC-2000ES as an input to a high-end D/A converter than feed its analog output directly to a preamp.

It takes very careful listening to hear the differences between a DAT recorded on the DTC-2000ES (using the digital output from a top-quality CD transport) and its



**TECHNICAL ADVANCES  
IN THE DTC-2000ES  
CAN BE HEARD,  
NOT JUST EXPLAINED.**

original CD. In fact, unless the CD is of exceptional quality, you may find the difference to be meaningless. If you are archiving analog records, you probably are not going to lose a bit of sound quality by recording 78s and most 45s on DAT with the Sony DTC-2000ES. Archiving 33 $\frac{1}{2}$ -rpm LPs may reveal the slight changes in sound quality I described above, but many digiphobes may be surprised. Since you are recording the colorations of your cartridge, tonearm, turntable, and phono preamp, you tend to record what many audiophiles feel is "analog sound." Of course, such archived recordings will forever include the colorations of the analog signal source you use, but this may be precisely what you want.

When it comes to live recordings, the Sony DTC-2000ES outperformed the microphones I could borrow and my skill in using them; determining the sonic limits of the DTC-2000ES in recording live music takes a sound engineer with more skills than I have. Yet it was very clear that using the DTC-2000ES is a far better way to provide demanding theater sound effects and recorded music for live performances than any of its competition.

In short, the Sony DTC-2000ES is a major step forward in both DAT and home recording. It is going to take a real churl, if

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not a neo-Luddite, not to admit that this deck offers sound superior to any stock analog recorder I can think of. The DTC-2000ES offers you the option of interacting with live music at moderate cost. You can also archive your collection of rare LPs or CDs, record comparative performances with minimal loss of sound quality, and easily upgrade the sound during playback with a top-quality D/A converter. And who knows, you just might find a friend to exchange tapes with. If DAT has not excited audiophiles in the past, the Sony DTC-2000ES demonstrates that it should!

*Anthony H. Cordesman*

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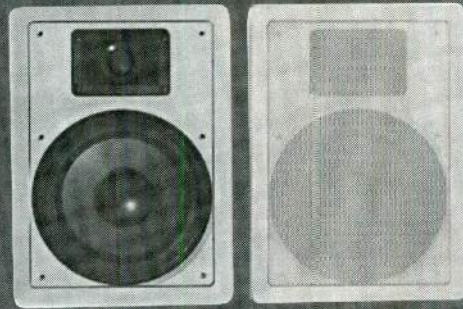
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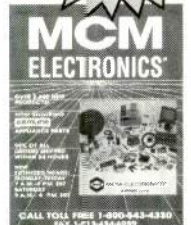
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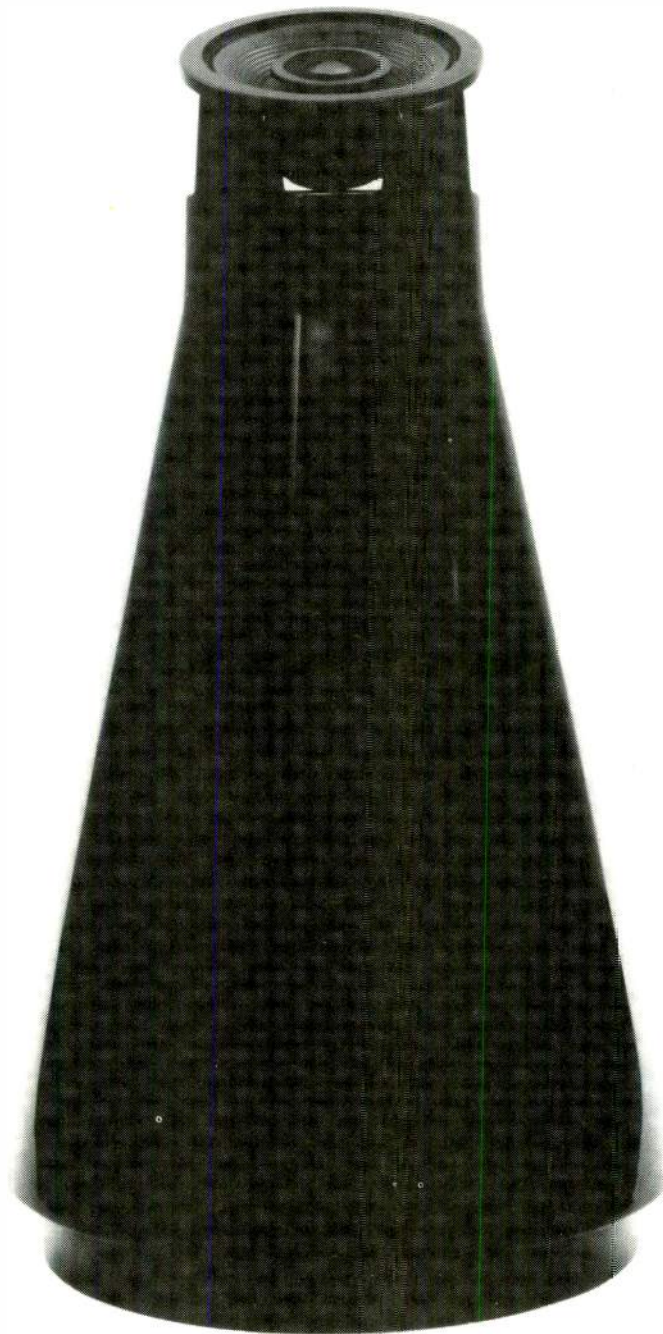
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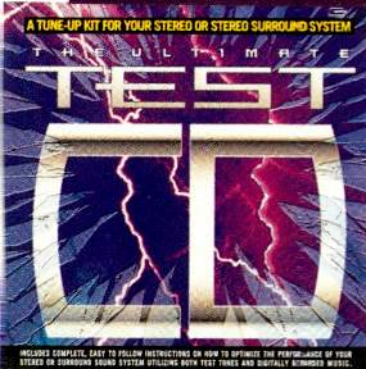
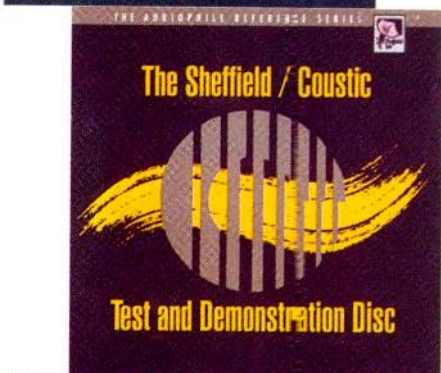
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# ESX, SHEFFIELD, AND STEREOPHILE TEST CDs



**T**est signals on CDs are produced digitally, with high precision, and are even more accurate than the laboratory oscillators which formerly generated the test signals for LP test records. Some engineers have found the test signals on CD to be so accurate that they are able to replace portable test instruments. The four CDs in this report have test signals plus a variety of musical selections that can help you achieve better sound. Each was created with a specific idea

in mind and employs different recording techniques for the musical selections. Even so, there are certain similarities. For example, all of them have tracks for channel identification and proper phasing of the output; all of them are also very useful for checking out listening systems even if you don't have test instruments.

The first test Compact Disc that is reviewed here is *The Sheffield/Coustic Test and Demonstration Disc*, which was produced by Sheffield

Lab (10040-2-T) for Coustic and Kinergetics Research. It costs \$19.95 and comes with a 12-page booklet. Track 1, "A Sonic Demonstration," has musical selections that are preceded by descriptions of what is to follow, and provides cues about what you should be able to hear if your system is performing well. Tracks 2 through 6 are complete selections from the Sheffield catalog. The voice on tracks 7 and 8 is for channel identification and phasing.

A warning is given on track 9 that the next tracks contain test signals that should be used with caution. These tracks, 10 through 42, contain signals that were cre-

ated by Richard Clark of Autosound 2000; tracks 28 through 42 are meant to be used with test equipment. I found that I could use the polarity test signal on track 10 to determine the absolute polarity of coherent earphones and loudspeaker systems by just listening. This signal has a four-pulse sequence, three positive pulses and a negative pulse, that repeats. When absolute polarity is correct, the three positive pulses sound "sharp and lean" and slightly higher in pitch than the fourth pulse, which sounds "slightly bassy and fat." I would describe the sound as "tick, tick, tick, tuck." The pink noise on track 18 can also be useful without instruments; just listen for coloration from your system. The sound should be smooth and wide-band, without any definite pitch.

Resonances in your loudspeakers or room—or reflections from room boundaries, furniture, etc.—can cause the sound to lack smoothness. If you move around the room and the character of the sound changes dramatically, you may have to reposition your speakers and perhaps do a little acoustical treatment of the room to achieve optimum results.

*The Sheffield/XLO Test & Burn-in CD* (Sheffield Lab 10041-2-T) was produced by Sheffield's Doug Sax for Roger Skoff's XLO Electric Co. Its price is \$29.95, and it comes with a very useful 20-page booklet detailing the contents of each track and how the tracks containing test signals should be used. Track 1 is for channel identification and balance, and track 2 is for phasing. Track 3 is a "walkaround" test with Sax talking while moving around a very live

room that measures 32 x 18 feet with a 13-foot ceiling; he also hits two claves together while he tells where he is in the room relative to the mikes. Near the

end of the track, Skoff and Sax speak at the same time, which allows you to test the resolving power of your system; if you can distinguish what each is saying, your system (and your hearing) is very good! Track 4 has a consistent hand clap repeated over and over, so you can walk around your room and listen to the

**SOME ENGINEERS THINK  
CD TEST SIGNALS ARE  
SO ACCURATE THAT THEY  
CAN REPLACE PORTABLE  
TEST INSTRUMENTS.**

#### Company Addresses

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way your system reproduces the sound when you are in different locations. Track 5 has a 315-Hz signal that you can use with an inexpensive multimeter to set the same level from your amplifier to your loudspeakers. Track 6 has a “demagnetizing sweep” signal that can be used to reduce any residual magnetism that may have built up in your system components. This is a relatively safe type of signal and provides a rather low level of demagnetization for resistor and capacitor leads, crossover inductors, cables, and phono cartridges. I haven’t seen any scientific proof documenting the sonic effects of this type of low-level magnetization. Its proponents categorize it as being different from the residual magnetism that happens to a tape head due to asymmetrical low-frequency or d.c. signals. Internal copper wiring and p.c. board traces, they say, become magnetized, due to current flow, and degrade the sonics. To say the least, it is controversial. I’ll keep an open mind while I await scientific evidence and just say that using this signal is like “mother’s chicken soup—it can’t hurt”! Track 7 has a “low frequency demagnetizing fade,” the more usual kind of signal for demagnetizing even the most highly magnetized devices; because of this it should be used with caution. It is intended to demagnetize low-frequency system components; I take this with a grain of salt also. Track 8 has “burn-in tones” that allow you to “exercise” any new components in your system. Tracks 9 through 13 are musical selections from the Sheffield catalog. The final track, 14, is an excerpt of track 9, only in mono. This track should appear to come from a small point between your loudspeakers; the better the loudspeakers, the smaller and sharper the point.

*The Ultimate Test CD* from ESX Entertainment (ESD-7059) has 45 tracks, comes with a 16-page booklet, and carries a price tag of \$7.98. After the introduction on track 1, tracks 2 through 6 are for channel identification: Left, right, the phantom center (both channels together in phase), and L + R and L – R to check for the correct connection of your loudspeakers. Track 7 is a 1-kHz tone in both channels at 0 VU (actually the tone is 1,035 Hz and –10.4 dB). Tracks 8 through 20 are test tones from 20 Hz to 20 kHz, in both channels, at –10 dB below 0 VU reference; the

booklet misstates the frequencies on tracks 8 through 11. Track 21 is a 440-Hz tone, which is an “A” for tuning instruments; again, this is misidentified. Track 22 is a repeat of track 7. Track 23 is pink noise, left and right. Track 24 is pink noise, in phase and out of phase. Track 25, “The Soundstage: Imaging, Depth, and Directionality,” features a man moving to different positions in a large, very reverberant room and stating where he is with respect to the microphone. Tracks 26 through 30 have bass drum and cymbal sounds to check frequency response and dynamics. The lowest frequency from the bass drum is 37.5 Hz and at only –10 dB from the 0-dB d.c. reference level; the cymbal has energy beyond 16,250 Hz, where the level is –27 dB. Tracks 31 through 34 have the sound of a scraper in the left, right, and center so you can check how your system reproduces this complex sound and also check the system’s transient response. Tracks 35 through 39 are musical excerpts. The final tracks, 40 through 45, are intended to help you set up a surround system. The last one is of a very good Dixieland band playing “Struttin’ with Some Barbecue”; it has a good sense of space and ambience, with most of the instruments recorded relatively close except for the trumpet, which sounds distant.

*Stereophile Test CD2* (Stereophile STPH 004-2) was produced by John Atkinson, the editor of *Stereophile* magazine. An informative, 26-page booklet accompanies this 31-track disc, which costs \$7.95 plus \$3 for shipping and handling. There are musical excerpts and test signals intended to help you identify and correct problems with your sound system as well as test signals intended for use with both inexpensive and expensive test instruments. Tracks 1 and 2 are for channel identification and phasing. Tracks 3 through 9 are musical excerpts. At 19 seconds into track 4, there is a –40 dB thump with a spectrum from 15 to 30 Hz, a good test for true subwoofers. Track 10 features Larry Archibald, the publisher of *Stereophile*, talking and clapping as he walks around, “mapping out” the sound of a recording venue; tracks 11 and 12 are piano selections performed in this same hall and using the same figure-8 coincident microphone pair. Track 13 is from Edward Elgar’s “The Dream of Gerontius” and features a soloist with chorus and orchestra.

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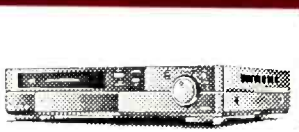
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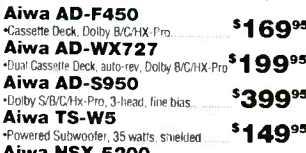
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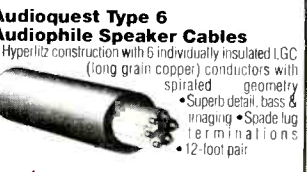


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Track 14 is "Eden," composed and performed by Corey Greenberg, a former contributor to *Stereophile*, in a studio using guitar sounds and artificial reverberation; 15 seconds in, there is a bass sound that reaches down to 30 Hz. Tracks 15 through 31 are test signals for evaluating system performance.

The first 42 seconds of pink noise on track 15 is correlated (i.e., the same in both channels), so that it should produce a clear, centered front image and no sound from the rear channels of a surround system. The pink noise on the remainder of this track is uncorrelated in the left and right channels and should produce a wide spread of sound with no specific central image; if you have a surround system, the sound should come from all of your speakers at the same level. Tracks 16 through 18 contain warble tones for the bass decade

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(descending from 200 to 20 Hz), the midrange decade (ascending from 250 Hz to 2 kHz), and the treble decade (ascending from 2.5 to 20 kHz). Track 19 has an interesting "Music Articulation Test Tone" by Arthur Noxon of Acoustic Sciences Corp.; it can be used to determine the resolving power of your system. Tracks 20 through 25 contain demonstrations of different types of distortion. Track 26 is claimed to have three index points. The signal at index 2 is supposed to demonstrate the effects of jitter by applying a 4-kHz modulation to an 11-kHz tone; I could only find index 1, a pure 11-kHz tone. Tracks 27 through 29 are meant to test CD players and tape recorders. Track 30 has 19- and 20-kHz tones at 0-dB reference level (I measured each tone as actually being at -6.5 dB); these tones are to be used with a spectrum analyzer to test for IM distortion. The last track, 31, also intended for use with a spectrum analyzer, has a 20-kHz tone at 0 dB (I measured this tone as -0.4 dB).

If I had to pick only one of these four CDs, I would be in a real quandary. *The*

*Sheffield/Coustic* disc has music by Clair Marlo on tracks 2 and 4 that I have used for demonstration for a number of years, the invaluable absolute polarity test, plus surround system test signals. *The Sheffield/XLO* disc has a very good "walkaround" test on track 3, the "clap" on track 4, the intriguing demagnetization signals on tracks 6 and 7, and an "M-S" (mid-side) microphone recording of the Los Angeles Philharmonic on track 10. The ESX disc has a very good test on track 25 to check for imaging, depth, and directionality; ex-

cellent bass drum, cymbal, and scraper sounds on tracks 27 through 34, and some surround tests on tracks 40 through 45. The *Stereophile* CD has a tremendous variety of music and test signals intended for listening and measuring. I am certain that I will be using this disc to correlate subjective comments from my listening panel with objective measurements I make with my lab instruments. I hope that I have described these CDs well enough for you to make a choice. As for me—I'd buy all of them!

Edward M. Long

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# CLASSICAL RECORDINGS



## BACH CELLO SUITES



### J. S. Bach: Cello Suites (Complete)

Nathaniel Rosen

JOHN MARKS JMR 6/7

Two CDs, DDD; 2:16:43

Sound: A, Performance: A

There are some 15 sets of these six Suites for Unaccompanied Cello in my nearly current *Schwann's Opus*, with about that many more recordings of individual suites. Mostly, these have been done on the standard modern cello, as opposed to the cello of Bach's day, an instrument with a higher, thinner voice. There are also guitar, harpsichord, and piano versions (I hesitate to say "transcriptions" since Old Johann freely reused music, passing it from one instrument and context to another). The notes say that Nathaniel Rosen is playing a 1738 violoncello from

Domenico Montagnana, and this instrument sounds to my ear like a very proper one for this music.

Insofar as the recordings on other instruments go, let me commend the Gustav Leonhardt harpsichord version of Suite No. 6 (as well as his Goldbergs) on Editio Classica (77014-2-RG). Definitely stay away from the marimba (!) version of No. 3. Both guitar and piano seem strained in some fashion when this music is played on them. The guitar does not have, to my ear, the range of voice from loud to soft, while the piano is, well, not a member of the family of viols, so that its voice is not as resonant.

Now, at this point, I need to tell you that I am not a school-taught music critic, and while this frees me from academic fashions, it makes my comments subjective, distant, and perhaps unreliable for you, so have a

care. Think of me as the Hunter Thompson of music criticism. But I like this music, and I think that if you like classical music at all, you should at least be aware of these suites, for they are among the very best things from one of the very best composers. These are some of the first classical stuff I could stomach as an adult after having had some years of classical piano training during grade school. Further, they bring up emotional ties to a long-gone girlfriend I dated during an unfortunate attempt at graduate school. We spent many evenings and weekend afternoons doing something other than studying as Milton Thomas' viola scraped along in the background; these were on three LPs from Concert-Disc/Everest.

### SMETANA: MÁ VLAST

Saint Louis Symphony Orchestra,  
Walter Susskind

VOX UNIQUE VU 9007, CD; 76:30

For older collectors, it's nice to have Vox still with us—as I recall, the first of the post-World War II new American labels, run by a courtly gentleman named Mendelssohn, a descendant of *the* Mendelssohn, or so it was said. (I never dared ask him.)

Of the six short tone poems, the only one heard very often is *Vltava*, or *The Moldau*, a beautiful evocation of a river from source onwards. The others seemed less interesting—were they merely unfamiliar? Not easy to say, since *Vltava* brought back a hundred musical memories! All six tone poems are out of that full-blown, mid-century Romanticism that knew no doubts yet, nor limits to harmless bombast. And sweet, juicy, folksy melodies.

After so much later and more biting music, Smetana's sound can be a bit smothering, no edges to it. But it is indeed perfect in its own way, the mid-continent equivalent from Bohemia (Czech country) of mid-Victorian.

Don't belittle our "lesser" orchestras. The Saint Louis under Susskind (spell out "Saint" and rhyme it with "paint") is excellent here, both in the gratifying accuracy of its ensemble and the perfect understanding of this old-fashioned style.

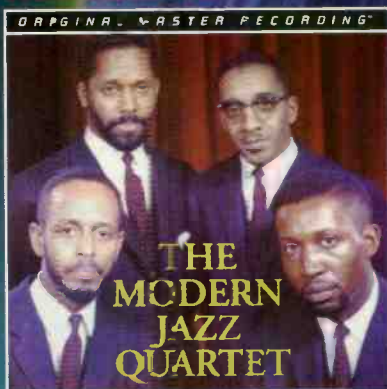
Edward Tamall Canby



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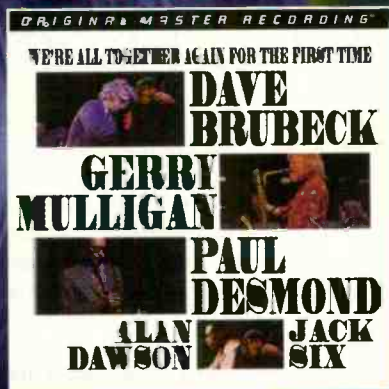


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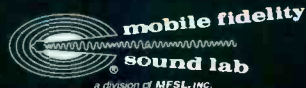


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Each suite has a similar form, being in six sections begun with a prelude and followed by five baroque dances. To my ear, these are rhythmically and stylistically dances, and indeed the sections bear the names of dances. But they are much more than that, since through the use of counterpoint to stretch and multiply melodic lines, Bach creates (at least for me) a near illusion of multiple instruments, a string quartet or small orchestra. While other composers certainly do use this device, I have never been satisfied with what I hear as their relatively amateurish interplay of the lines. Only in the Benedetto Marcello harpsichord works have I heard an equivalent of this.

Now, I'm told that current fashion is to play these suites in a "romantic" way, and that the leading exponent of this style is Yo-Yo Ma, whose three-CD set burst out in 1983 (CBS M2K 37867). I am not certain of all the implications of "romantic" in this context, but Ma's version would be very difficult to dance to, what with his extending of various notes, suppression of the beat, and sudden, furious, *forté* attacks on various phrases. It's as if someone with a migraine headache had written this music, instead of, say, someone calmly contemplating the intricacies of baroque dances. I feel that Ma's rendition of this music is nearly as far as one might go in this direction. Rosen's, to my ear, is in this direction too, perhaps 75% of the way. Yet he adds things here, ones that are interesting and worth listening to again, as one might compare different Oriental rugs, all of the same basic design. But his style is not as flamboyant as Ma's.

Of the other cello performances, the one I like best is that of Janos Starker on two Mercury CDs (432756-2) from 1963. There is a great deal of strength and expression to these readings, but not so much that the dance forms are lost. While Pablo Casals' recordings on Angel remain in the catalog—and rightly so, given the greatness of the performer—they seem dated to me, mostly because of their limited sonic quality.

The sonics of the Rosen CDs are excellent. Recording engineer Jerry Bruck used a single Schoeps KFM-6 mike in State University of New York/Purchase College's recital hall to feed a Nagra D 20-bit digital reel-to-reel recorder. A Meridian 618 was used as the 20-to-16 processor. Background noise is quite low, and the hall's acoustics are good, though I think I personally would have preferred a "wetter" mix. (A critic has to have some nit to pick.)

Would I buy this? Yes. Do I prefer it to the Ma? Well, no, it's more of an "alternative" to Ma. And I would still keep the Starker in my collection of these suites. *E.P.*

**Richard Strauss: Cello Sonata, Op. 6; Robert Schumann: Adagio und Allegro, Op. 70; Brahms: Cello Sonata, Op. 38**

*Kim Bak Dinitzen, cello;*

*Elisabeth Westenholz, piano*

KONTRAPUNKT 32172, CD; 66:04

In times way past, I used to avoid cello recordings whenever I could, especially those by the big names. It was the early era of exuberant microphoning, the soloists close up, routinely presented as enormous elephantine presences, with a piano or maybe a whole orchestra vaguely audible in the background! If you don't believe me, ask somebody else who remembers. What a change, then, to report here the very opposite: The cello is played down; the big piano dominates. I kept urging, in my head, more, *more*, and I meant the cello.



On the other hand, a reviewer's toughest job these days is to distinguish between musical performance and recording technique, with no help but the listening. My final impressions of this cellist—after much doubt—are (a) his technique is superb, perfectly in tune, never sloppy or inaccurate, the high melodies as clean and clear as those of any violinist or better, and (b) somehow, he is a colorless, unimaginative performer. Everything sounds the same. It is definitely the pianist who leads, and that without any musical doubt. She is the one who puts the oomph, the humanity, the strength into this music!

What, then, if the cello had been miked louder, closer, more prominently, if not with exaggeration? This had me bothered through two complete playings. Yes or no? My final judgment is that in spite of superb technique, all sorts of prizes, etc., and in spite of possibly a weak microphone presence, this young cellist is somehow colorless. Everything *does* sound alike, ever so beautiful, ever so monotonous. More, *more*, I kept saying to myself! And this became not *more miking* of the cello but *more music*.

The program is an interesting three-way comparison, even so, and the piano carries it through nobly. Richard Strauss? It sounds much, much earlier, like an extroverted and extended Schumann, astonishing if you have not heard early Strauss. Not surprising: He composed the sonata at age 17. Interesting that he used Schumann, rather than the later Brahms, as his clear model. Schumann's manner, but all extroversion; expressive but long to the point of boredom—Strauss begins to sound all too much like himself, even at the tender age of 17!

The brief Schumann is darkly introverted, well before his mental collapse. But it is the Brahms sonata, a relatively early work, too (1866), that is ever so clearly the superior piece among these three. A rather arresting comparison. Also dark, much deeper—in the end, more genuinely Romantic than the other works. And interestingly authentic in this performance—the "scherzo," already well away from Beethoven's high-speed model, is really played here as Brahms directed, slowly, quasi minuetto. Good thinking.

*Edward Tatnall Canby*

**Stravinsky: Music for Piano (1911-42)**

*Aleck Karis and Robert Lubin, pianos*

BRIDGE BCD 9051, CD; 73:12

The severe young man at the piano on the CD cover is Stravinsky himself, who began his career mainly as a pianist and conductor. This extraordinary CD is a compilation of works from his "middle period" plus the big item that comes first, Stravinsky's own transcription of scenes from *Petroushka*, one of the most difficult and expert piano scores ever put down on paper—with up to four lines of simultaneous music for two hands! Aleck Karis does more than encompass all its difficulties with the greatest of ease. I jumped a foot when it began—such power, such rhythm! But even more than that, he has quite an exquisite sense of shaping, phrasing, drama, even with the steeliest fingers that I have ever heard. In other words, a tremendous musical mind, and when Robert Lubin joins him for several piano duets, it is the same. Stravinsky would be delighted, I am quite sure.



After *Petroushka*, the rest of the disc ranges from seldom-heard to unfamiliar, out of the teens and '20s and on. But it is a familiar Stravinsky sound, like no other, and you will be astonished at his ability to compose such non-Russian idioms and ragtime, large as life. The only work I knew well was the Circus Polka of 1942, music for an elephant, and very elephantine. I had always heard it was written for the Barnum & Bailey circus, whose management was horrified; it says here, instead, that the choreographer Balanchine commissioned it—had in mind a ballet with a real live elephant. More likely story. It is amusing music, sounding just like tons of elephant and quoting a grotesque bit of Franz Schubert! The piano recording is excellent, so that the listener is never really bothered by those incredibly powerful fingers.

*Edward Tatnall Canby*



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# ROCK ~ POP RECORDINGS

## PAGE & PLANT



### No Quarter

Jimmy Page & Robert Plant  
ATLANTIC 82706-2, 75:40  
Sound: B+, Performance: A-

**J**immy Page and Robert Plant have had a long and complicated association. As collaborators, friends, rivals, and the nerve center of Led Zeppelin, they created music that was awe-inspiring, ridiculed, majestic, bombastic, innovative—pick your adjective. When Zeppelin sank under its own weight (following drummer John Bonham's death) almost 15 years ago, Page and Plant embarked on, respectively, new band projects and a solo career that both casually and shamelessly lifted elements from Zeppelin's canon. The two have had numerous impromptu

reunions as well as an aborted writing session in 1986. Suffice to say, time has revealed one distinct fact: Page and Plant do their best work together.

*No Quarter* is being touted as Page and Plant's de facto reunion; not including former Zeppelin bassist/keyboardist John Paul Jones was a deliberate effort to distance themselves from the Led Zeppelin name. But are we bearing witness to a major embarrassment—like past "Led Zeppelin" reunion attempts—or is this the inspired get-together that fans have awaited? Can Page and Plant still write together? Are they serving up something different, or is *No Quarter* merely a pocket-lining nostalgia trip?

Unquestionably, *No Quarter* overflows with inspiration; it's hardly a rote recitation of the Zeppelin songbook. Here, Page and Plant strive for greatness, sometimes capturing it and sometimes merely brushing against it, by going the multi-culti route. Led Zeppelin carried the influence of international music—particularly, Moroccan and Indian—long before most of the current East-meets-West rock 'n' rollers. But unlike Zeppelin, which only flirted with ethnic musics, *No Quarter* plunges right into cultures. Recorded in London (before an audience), Wales, and Morocco, the album presents ingenious new arrangements for music that was thought to be a closed chapter in rock history.

Page and Plant accomplish this with four ensembles—a core rock base that's augmented by hired guns

Photograph: Keith Carter

### THE SUN RECORDS COLLECTION

Various Artists

RHINO R2 71780, three CDs, 3:08:01

Sound: B to C, Presentation A+

**I**f rock 'n' roll was born in a particular time and place, the delivery room must have been 706 Union Avenue in Memphis—the home of Sun Records. It was here that Sun's owner and founder, Sam Phillips, recorded the legendary sides that would launch the careers of Elvis Presley, Carl Perkins, Roy Orbison, Jerry Lee Lewis, Johnny Cash, and many others, subsequently altering popular music forever. Without Phillips, who knows whether Sun's roster would have found success elsewhere? Had they languished in ob-



scurity, there still would have been rock 'n' roll, but it's difficult to imagine what it would have sounded like. This 74-track box set, spanning the years 1950 to 1966, compiles Sun's most important and best output. A special bonus is the inclusion

of a track considered by many historians to be the first rock 'n' roll record ever: "Rocket '88" by Jackie Brenston with His Delta Cats. *The Sun Records Collection* is well packaged and annotated—a must for any serious rock enthusiast.

Daniel Levitin

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playing traditional British Isle instruments, an Egyptian orchestra that uses indigenous percussion and string instruments as well as Western orchestral string instruments, a 29-piece chamber orchestra, and a four-man ensemble of Moroccan musicians. It's ambitious, it's indulgent, and it works.

While several songs remain close to their original recorded versions—"Thank You," "Gallows Pole," the blues vehicle "Since I've Been Loving You," "No Quarter"—the startling revelation is how well the "ethnized" songs lend themselves to rearrangement. "The Battle of Evermore" works especially well with a cross-cultural arrangement, combining Celtic percussion, hurdy-gurdy, and the vocals of Najma Akhtar, who sings Sandy Denny's original part—with vocal inflections common to music from Akhtar's native India—with remarkable effect. A half-timed "Nobody's Fault but Mine" includes banjo, tin-whistle, and hurdy-gurdy in an almost bluesy, neo-Appalachian-meets-Misty-Mountains arrangement. "Kashmir," what Plant considers the definitive Led Zeppelin song, is made even more exotic than its *Physical Graffiti* original by accompaniment from every musical participant involved in the project.

*No Quarter* includes three new songs, two of which indicate where Page and Plant may be headed. "Yallah" and "City Don't Cry" are

like field recordings, made with Moroccan Gnawan musicians in the middle of a village square, and the results resemble jam sessions more than songs. Yet the Gnawan specialize in trance-inducing ritualistic music [see John Diliberto's review of *The Trance of Seven Colors* in the December 1994 issue], and combined with Page's guitar—distorted to an effect more reminiscent of a stomp box than the overtones of a Marshall amp—and Plant's stream-of-consciousness prose, the result is mesmerizing. "Wonderful One," despite Page's eloquent guitar playing, falls flat. It's *No Quarter's* only throwaway.

Unfortunately, as good as everything else is, it takes only one lackluster song—and an original nonetheless—to raise a specter of what future Page and Plant songs will be like. That, of course, remains to be seen. What is fact right now is that at the very least, *No Quarter* makes their solo careers seem almost perfunctory. At the most, it rewrites Led Zepelin and rock history books. *Mike Bieber*

#### Heartaches and Harmonies

*The Everly Brothers*

RHINO R2 71779, four CDs, 4:27:00

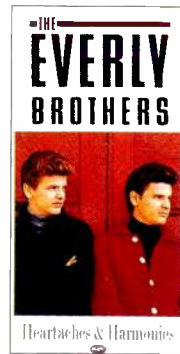
Sound: A, Presentation: A-

Listening to *Heartaches and Harmonies*, it's apparent how intuitive Don and Phil Everly

were, somehow finding the perfect songs to cover. From their fabulous string of Felice and Boudleaux Bryant hits to the Paul McCartney and Mark Knopfler compositions on their comeback albums, everything seems perfectly matched for their gorgeous and unmistakable harmonies. Originals like "When Will I Be Loved" and "Man with Money" also remind listeners that Don and Phil themselves wrote some superb songs.

This stellar box set covers all phases of The Everly Brothers' career, beginning with their family's radio show of the early '50s, their first commercial recordings for Columbia, and their late '50s breakthrough on Cadence and continuing through the years at Warner Bros. and RCA and the '80s comeback albums for Mercury. All the hits are here, plus a lot of other selections that help to flesh out their story.

Bill Inglot's remastering is greatly appreciated. The Cadence-era material sounds remarkably vivid, as if it was recorded yesterday. Only during some Warner Bros. material from the mid-1960s does the sound get



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murky, probably due more to the condition of the master tapes than to any oversight by Inglot.

One quibble is that "T for Texas" and "I Wonder If I Care As Much (Version Two)," both from the *Roots* album, should have been allowed to segue as they did originally; separating them makes the intro to "I Wonder," where the tempo increases during the middle of a crossfade, sound weird.

The accompanying book—typical of a Rhino set—is good, filled with photos, essays, tributes, a discography, and song-by-song reminiscing by Don and Phil. This box is the tribute The Everly Brothers richly deserve.

Michael Tearson

### Duende: The Passion & Dazzling Virtuosity of Flamenco

Various Artists

ELLIPSIS ARTS ELLI CD 3350

Three CDs, 2:57:49

Sound: B, Performance: A-

*Duende* strives to relate flamenco's tradition to its current popularity in contemporary music, and while it doesn't ignore history, the real focus is on the stellar performers on the current flamenco scene.

The first of three discs concentrates on flamenco's impassioned singing styles. Included

are the raw, throaty strains of Enrique Morente and the torrid plaints of Lole y Manuel. A highlight is one captivating older selection, a recording by the legendary La Nina de los Peines made in the '30s.

On the second disc, the emphasis is squarely on guitar, with instrumental selections that include the bouncing, jazzy Earl Klugh-ish feel of Tomatito and a 1981 recording by Paco de Lucia.

Two particular standouts are a selection by Sabicas recorded just before his death and a rare 1936 glimpse of Ramon Montoya. Unquestionably, *Duende* excels with its magnificent presentation of flamenco's powerful guitars.

The third disc explores modern hybrids. These range from the updated folksy orchestration of the performer Jaleo (who uses flutes) to salsa, jazz fusion, flamenco piano, and even a variation that—with its incorporation of clarinets—is reminiscent of klezmer.

Flamenco novices will probably not walk away from this collection with a better sense of the connections between classic and modern. But *Duende* does provide a wonderful

snapshot of the current state of flamenco's art, which is remarkably healthy, full of vital new directions and superb musicianship.

Michael Wright

### Space-Age Bachelor Pad Music

Esquivel

BAR/NONE BRN CD-043, 38:12

Sound: B+, Performance: B+

This CD's title perfectly describes the mad, wiggly music arranged and conducted by Juan Garcia Esquivel. Try to imagine a Mexican Spike Jones, complete with hairpin turns dotting the arrangements plus widescreen stereo with strange sound effects. As for lyrics, there's little more than "zu zu zu zu" or a long "aaahh." If you need more pedigree, consider that Ernie Kovacs used Esquivel's adaptations of "Jalousie" and "Sentimental Journey" (both included here) as soundtracks for routines. Esquivel's originals, such as "Whatchamacallit" and "Latin-esque," are startling and fresh, every bit as inventive as his covers. These 14 tracks were originally released between 1958 and 1967 on RCA Victor, and hearing them now is a genuine treat. Let's have more!

Michael Tearson



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# JAZZ~BLUES RECORDINGS



## The Complete Bud Powell on Verve

Bud Powell

VERVE 314 521 669-2

Five CDs, 5:14:21

Sound: A-, Performance: A+



## The Complete Blue Note and Roost Recordings

Bud Powell

BLUE NOTE CDP 7243 8 30083 2 2

Four CDs, 4:33:15

Sound: A-, Performance: A



There's hardly a more enigmatic figure in jazz than pianist Bud Powell. A protégé of Thelonious Monk and a front-line warrior during the musical revolution that resulted in be-bop (a lexicon originated by Charlie Parker and Dizzy Gillespie), Powell translated this new idiom to the piano. In doing so, he played with dazzling technical facility and also exhibited a heart-wrenching vulnerability. For Powell,

the net result was a vernacular all his own, one that set the stage for modern jazz piano.

Powell's personal story is suffused with tragedy, inspiring movies like *'Round Midnight* while propagating its share of popular myth regarding jazz musicians and even the nature of genius. Much of this centers on a particular night in 1945 when Powell, only 21 at the time and a member of trumpeter Cootie Williams' band, was arrested in Philadelphia for disorderly conduct and beaten senseless by the police. Powell was by nature shy and introverted, but after that infamous night came a lifetime marked by psychiatric hospitalization, drug abuse, alcoholism, and generally erratic behavior.

Powell exhibited signs of genius prior to 1945, but it wasn't until a few years later, beginning with the 1947 Roost session that marked his debut as a leader, that Powell—in a less-than-clear frame of mind—unbridled the passion that permeated his playing and his brilliant compo-

sitions. As Jon Hendricks sang in his adaptation of "In Walked Bud," the famous Monk composition dedicated to Powell, "In walked Bud, and then they got into something."

That "something"—be it the mystique of genius or simply the reworking of the clavier for be-bop and beyond—is captured beautifully in two compilations released just as Powell would have been celebrating his 70th birthday. With the simultaneous issue of *The Complete Bud Powell on Verve* and *The Complete Blue Note and Roost Recordings*, we're presented with a clearer and more vivid portrait of this towering yet enigmatic artist. And like one of Powell's fractured, arpeggiated runs, the picture is full of inference and open to interpretation.

Photograph: David Gahr

## DESERT LADY/FANTASY

Toshiko Akiyoshi Jazz Orchestra

COLUMBIA CK 57856, 56:02

**D**esert Lady/Fantasy is a set of six complex and luscious compositions from the tireless pianist/composer/orchestrator/bandleader. Toshiko Akiyoshi, who readily cites Bud Powell, Charles Mingus, and Duke Ellington as prime influences in her life, further expands her repertoire while continuing her approach of layering multiple reeds and flutes in her arrangements, getting the most out of her 16-piece band.



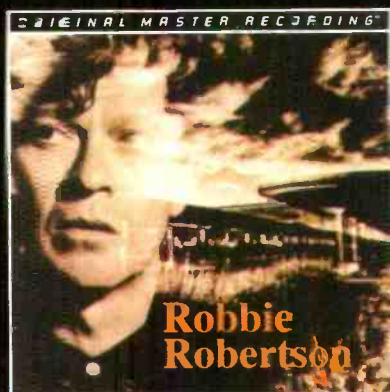
An inspiration for this album was Japanese director Hiroshi Teshigahara's 1964 film *Woman in the Dunes*.

As in the past, whatever the source that serves as Akiyoshi's inspiration surfaces in her compositions and arrangements in a way that allows listeners to take distinct musical voyages. The title track, a 15-minute-plus neo-suite, juxtaposes exhilarating submovements—conga and trumpet duetting, solo flute passages, all-out attacks from the band, and moments of silence. Akiyoshi's work sounds as up to the minute as ever. And she's more forthcoming with her piano than on many previous dates—which is great considering just how good a keyboardist this bandleader is. *Jon W. Poses*

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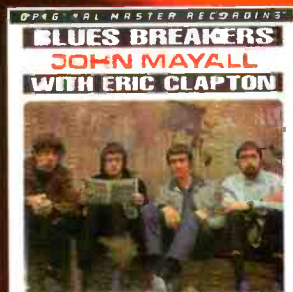
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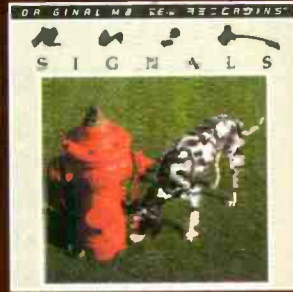
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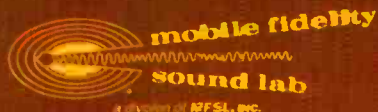
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Together, these packages compile vital recordings that span less than two decades, documenting a period in jazz history when transition was occurring at a seemingly lightning-fast pace. On the Blue Note/Roost set, you'll hear not only Powell's first recordings as a leader but also a 1947 trio session with Curly Russell and Max Roach, plus the landmark 1949 recordings of Powell's Modernists quintet, which included trumpeter Fats Navarro and a then 18-year-old Sonny Rollins on tenor. The Verve collection features the dazzling 1949 trio sessions that began a long and productive association with producer Norman Granz, the 1951 solo sessions, and

some truly prophetic takes with drummer Arthur Taylor from 1955.

Both Blue Note and Verve have remastered these recordings with care and a light touch, which is to say that not much was done to alter them; room sound and all those intangibles are well preserved. The music is further contextualized by the inclusion of previously unreleased material—alternate takes and, in Verve's case, studio chatter. Verve also includes alternate takes to the point that, while illuminating, they break up the rhythm of the program.

Physically, the packages are things to behold—notated, annotated, and photo-rich,

all of which lifts or at least embellishes the Powell mystique. Verve's 150-page booklet is particularly arresting for its reliance on commentary and anecdotes from musicians such as Walter Bishop, Jr., Max Roach, and Bertha Hope. To Verve's credit, these artists discuss not only Powell's music but also some frequently raised questions concerning boxed sets and whether unissued material should actually be released.

As revealing, compelling, and necessary as the essays are, they remain window dressing to the reason why we entered the store: Powell at the piano, playing his tunes, virtually establishing the trio format as it exists today, and paving a dangerous but essential road for just about any pianist who followed.

Larry Blumenfeld

**Portrait of the Artist As a Young Man, 1923-1934**

Louis Armstrong

COLUMBIA/LEGACY 57176

Four CDs, 4:15:19

Sound: C+, Presentation: A+

This 81-song set traces the beginning of Louis Armstrong's recording career—and with it, the development of jazz. As Miles Davis noted, there is nothing that can be played that Louis hasn't already played; his unique sense of time, his tone, and his choice of notes paved the way for everyone else.



Armstrong's development as a soloist is fun to follow through these 11 years. Some high points include his solos on "Everybody Loves My Baby" (1924) and "Big Butter and Egg Man" (1926), the stop-and-go rhythms of "Potato Head Blues" (1927), and Earl Hines' seraphic vocal harmonies on "Basin Street Blues" (1928). All of this material influenced players for decades.

However, the restoration is disappointing. Many cuts are hissy even though there is no musical content in the upper frequencies. This is something that should have been corrected.

Daniel Levitin

**Feel Like Rockin'**

Mark Hummel

FLYING FISH FF 70634, 59:51

Sound: B, Performance: B+

With *Feel Like Rockin'*, Mark Hummel instantly steps into the first rank of the rising generation of blues harp-blowers/singers. Despite being recorded over several years

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with a changing cast of players (including Sue Foley, Charles Brown, and Brownie McGhee), *Feel Like Rockin'* arrives as a satisfying, consistent album.

Hummel appears equally at home with big band numbers, Jimmy Reed tributes, Little Walter-style blues, chromatic instrumentals—seemingly anything he touches. Even the changing rhythm section merits special attention. Check out the barely controlled chaos of the aptly titled “Georgia Slop.” Strong originals like “Nickels and Dimes” show Hummel’s gift for marrying contemporary lyrics to a robust blues framework. Only



Little Charlie and The Nightcats have had equal success in updating the genre.

In the stunning opening, Hummel confidently shouts to the bandleader, “I got to hear a beat that my feet can understand.” Me too. Why haven’t more musicians gotten that message?

Roy Greenberg

### Manhattan Moods

McCoy Tyner & Bobby Hutcherson

BLUE NOTE CDP 8 28423 2 3, 57:52

Sound: A, Performance: A

Put pianist McCoy Tyner and vibraphonist Bobby Hutcherson together, and you may as well tell everyone else to get lost; they’d only gum up the works. *Manhattan Moods* is two mature monsters on the loose, two master jazz musicians just out for a walk in the park. What seems like the most visceral of activities for these two veterans—playing music—translates into a dynamic success.

Hutcherson, who hasn’t received the acknowledgment from press and public that he truly deserves, pushes Tyner to the right musical places. The pianist, who’s been indelibly etched in everyone’s psyche since he hooked up with John Coltrane

so many years ago, draws from and pulls Hutch along, displaying his powerful but subtle articulation. The selections include a couple of



originals from each participant, Thelonious Monk’s “Blue Monk,” Mal Waldron’s “Soul Eyes,” and standards by the Gershwins and Jerome Kern. Each of *Manhattan Mood’s* nine pieces houses romance, sentiment, swing, and a passel of gem-like phrases that will wash over anyone who cares to listen.

The Tyner bombasticity, an unbecoming trait in recent years, doesn’t exist here, and Hutcherson’s sound, so rich and resonant, prevails throughout. Thank you, gentlemen.

Jon W. Poses

### That Shearing Sound

The New George Shearing Quintet  
TELARC CD-83347, 66:31  
Sound: A, Performance: A-

Here, pianist George Shearing re-creates the sound of his famous ’50s quintet, complete with vibraphone and guitar doubling his melody. Shearing is not a flashy player, but his block-chord style and left-hand counter-melodies were a huge influence on players such as Bill Evans.

The recording quality, typical for Telarc, is excellent and very clear. The spacious sound-scapes pans each instrument wide, and the

phasing on the drum kit is perfect. Shearing’s own playing seems to lack some of the cleverness of four decades ago, but the other players—particularly guitarist Louis Stewart and



bassist Neil Swainson—give the performance some edge. The repertoire is varied and includes some Latin-flavored versions of standards like “I’ll Never Smile Again” and “Autumn Serenade,” alongside more straight-ahead readings of Evans’ “Very Early” and Shearing’s own wistful “Lullaby of Birdland.”

Daniel Levitin

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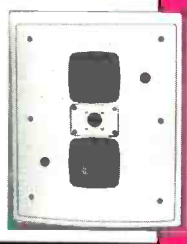
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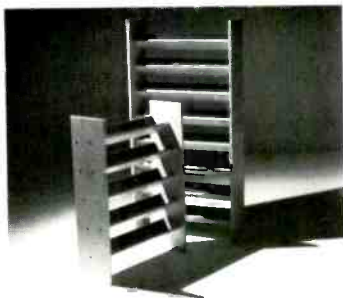
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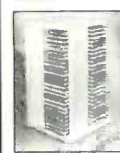
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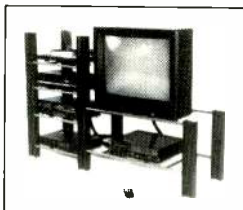


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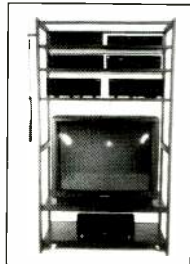


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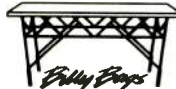
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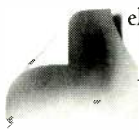


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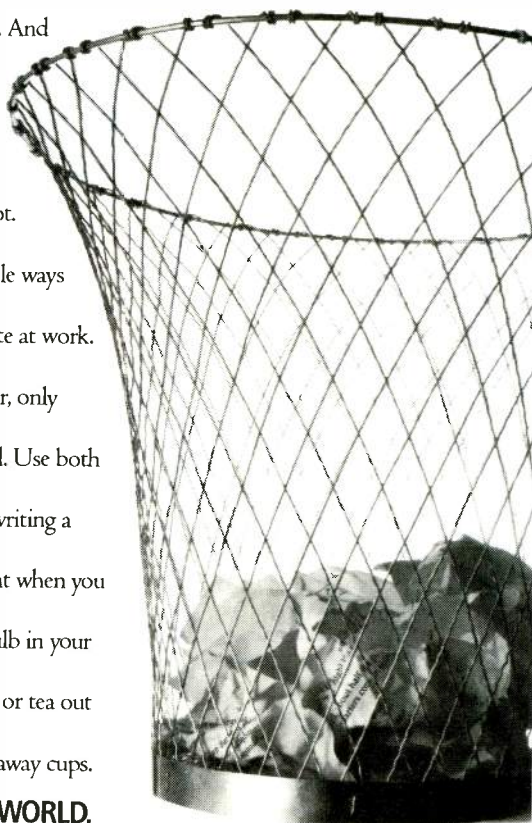


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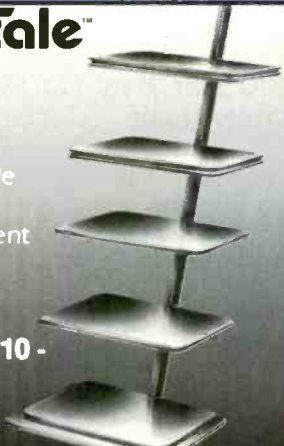
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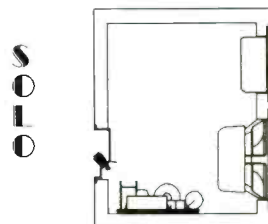


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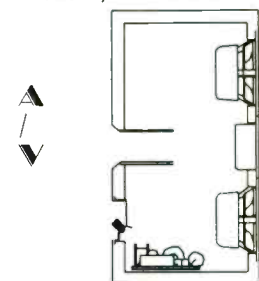
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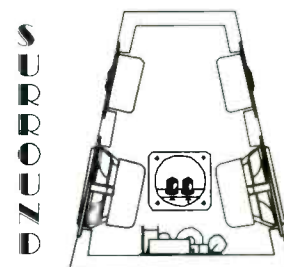
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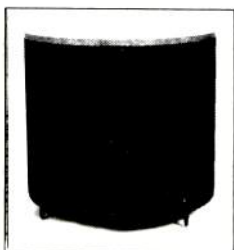
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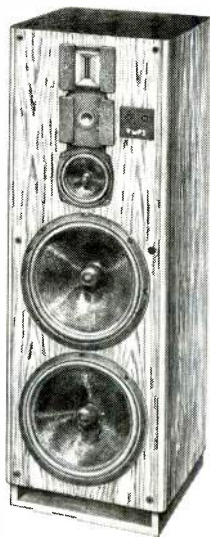
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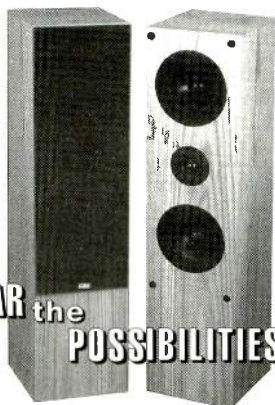


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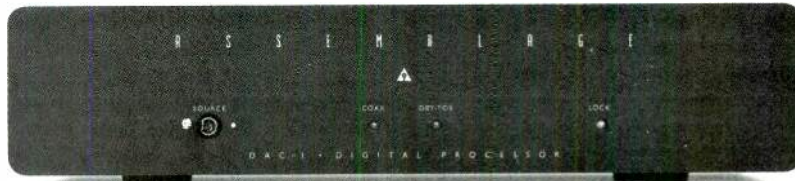


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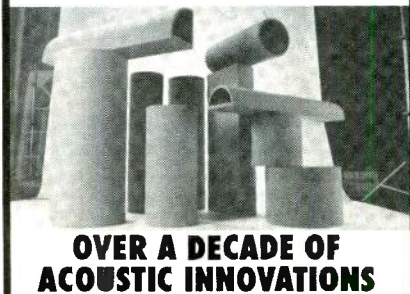


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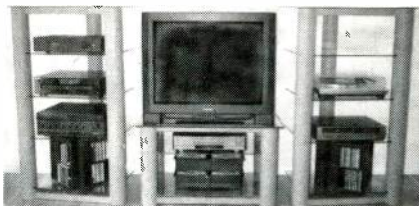
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David W. Leckey  
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## TERK AM•FM Q Active Antenna

With the Model AM•FM Q antenna (\$99.95), Terk Technologies has largely succeeded in solving many of the problems inherent in radio signal retrieval. Signal gain is dialed in with two knobs, for narrowband and wideband modes. Discrete wire leads for AM and FM attach to corresponding connecting posts on a tuner/receiver, and an outboard transformer plugs into the wall or a switched receiver outlet. A 300- to 75-ohm adaptor and concise instructions are also provided; PAL or F-type adaptors are optional. LEDs on the unit's front indicate the antenna's operating status. In urban trials using a Revox B760 tuner, which features a 0-to-10 signal-strength meter, an omnidirectional roof antenna averaged an 8.8 reading for 10 popular New York-area stations, and the Terk averaged 8.9. With the AM•FM Q, all stations were heard with good stereo separation and very low background noise, if any. Thus, apart from a slight suspicion about build quality, a fine performance.

John C. Hallenborg

For literature, circle No. 120



GRADE: B+

## PlayBack

### MACKIE

## MicroSeries 1202 Portable Mixer

One of the product wonders of the pro audio world, the Mackie MicroSeries 1202 12-channel mike/line mixer is priced so ridiculously low that audiophiles can make good use of it for home recording projects without spending even half a kilobuck. For \$399, the MicroSeries 1202 offers four high-quality balanced mike inputs with phantom power (using Neutrik XLR connectors), four stereo unbalanced line inputs,

pan control, individual channel gain, AUX sends, and stereo peak meters as well as

an ultra-clean headphone amp. You can even bypass the individual channel gain and EQ and use the MicroSeries 1202 as a discrete four-channel mike preamplifier, with the channel insert points as direct outputs. Besides auditioning the 1202 with several microphones, I tried it with a CD player via the

tape inputs and found its sound as clean

as that of some audiophile stereo preamps costing twice the price. With all these features plus solid metal construction and U.S. manufacture, the Mackie MicroSeries 1202 is a definite best buy.

John Gatski

For literature, circle No. 121



GRADE: A

## DENON

### AVR-2500 A/V Surround Receiver

The A/V receiver market has become rather crowded, with most models offering similar features, including multiple amplifiers for five-channel home theater, Dolby Pro Logic, various DSP functions, and full-feature remote control. The Denon AVR-2500 (\$1,000) has all these features and is rated at 80 watts per channel for the front and center and 25 watts per channel for the rear. But it has something most other A/V receivers don't: Smart Radio, based on the Radio Data System (RDS) that enables FM broadcasters to transmit various data to RDS-compatible receivers.



With Smart Radio, you can scan stations by format as well as display call letters and slogans; you also can see artist names, song titles, and other information. The AVR-2500 can even put the Smart Radio text on your TV screen if you route video through the receiver. Overall, the AVR-2500 is very easy to use (a big plus in my book). The surround setup test via on-screen TV display was a snap, and I like being able to adjust all channel levels from either the remote or the receiver. Whether you're a home theater buff or an audiophile with broader horizons, you won't be disappointed.

John Gatski

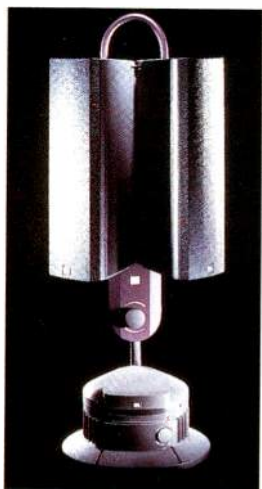
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GRADE: A

# PlayBack

## JBL SoundEffects System

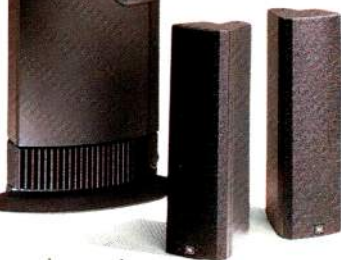
GRADE: A-



SoundEffects is a modular home theater system that includes two Music (satellite/subwoofer) speaker systems, two Movies (satellite/center) systems, and two Magic! wireless component packages. Each Magic! includes an r.f. transmitter and receiver plus an amplifier; the Magic! 2 also includes a portable stand, the Taxi. My test setup consisted of a Movies 2 (below left, \$599) for the sides and center, a Music 2 (below right, \$949) for surround, with its 100-watt powered subwoofer in the front channels, and a Magic! 2 (left, \$649) for feeding surround to the back of the room and for holding up the surround speakers, as shown. The subwoofer uses two 5¼-inch drivers; the other speakers each had two 3½-inch mid/woofers flanking a dome tweeter.



The sound overall was pleasant and natural. Pink noise was smooth; however, the



satellites seemed to overemphasize upper bass and lower midrange a bit when used without the sub. The satellites have no audible output below about 50 Hz; the sub gets down below 30 Hz. In the wireless surround setup, the amp and receiver nest on the Taxi stand's base, adding stability; the two satellites can be swung together to face the same direction or swung 180° apart. For surround, JBL advises placement behind the listener, facing the side walls. The SoundEffects system is neat and technically interesting—and most important, it sounds good.

I.B.

For literature, circle No. 123

## MARANTZ Slim Series

In your listening room, the Slim Series components stand ready. You touch a single button on the system remote, and all three displays light up. Then, the flip-down front panels open automatically, in succession: SD1020 cassette deck, CD1020 CD player, and SR1020 receiver. A digitized voice respectfully appeals, "At your service"—just kidding, though it's easy to imagine such a feature, given the ultra user-friendliness of the Slim Series. The units are sold individually (\$399 each for the CD and cassette decks, \$499 for the receiver), but together they employ Marantz's System Link circuitry



GRADE: A-

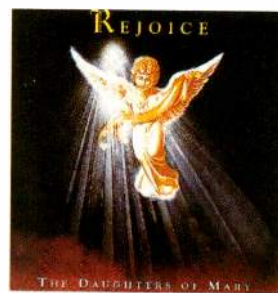
and the receiver's 45-key system remote to simplify operation. Performance and sound quality are fine across the board.

Ergonomics lapse in only a few instances: Music scan for CD and tape is accessible only via their own remotes, not the system remote, and music search for tape is only on that deck's front panel. Also, the CD display's lack of a space between the track and time indications makes a readout of, say, 13 tracks with a playing time of 42:38 look like 1342:38.

K.R.

For literature, circle No. 124

## RENAISSANCE ENDEAVORS CD



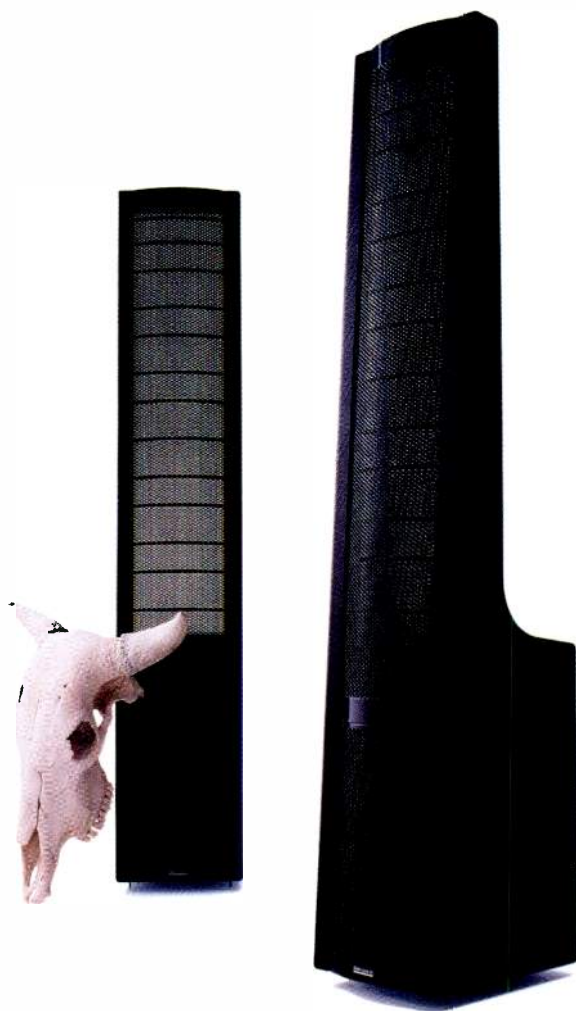
Wow! *Rejoice*, a real Christmas album! After years of drought, the sweet, clear voices of The Daughters of Mary are like a gentle rain, or should I say snowflakes! This choir of nuns, accompanied by a full orchestra conducted by Angelo Di Pippo, bring a feeling of real joy as they sing "Silent Night," "The First Noel," "O Little Town of Bethlehem," "Joy to the World," and 16 other Christmas favorites. The album was produced by Di Pippo and Joseph Scarpa and engineered by Fred Guarino at Tiki Recording Studios using the latest digital equipment and vintage Neumann microphones. *Rejoice* is available on CD (\$14.95) and cassette (\$9.95) from Renaissance Endeavors (P.O. Box 30, Mineola, N.Y. 11501). I love it!

GRADE: A+

E.M.L.

"PlayBack" mini-reviews are the result of short, sweet, and sometimes deadly testing by our all-too-experienced editors and writers. These hands-and-ears-only write-ups may look like new product announcements, but the grades and text reflect what the reviewer thought after less than an afternoon's "honeymoon."—E.P.

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